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## EDWARD JACKSON'S PLACE IN THE HISTORY OF REFRACTION

## FIRST JACKSON MEMORIAL LECTURE\*

WILLIAM H. CRISP, M.D.

*Denver 2, Colorado*

To understand the part played by Edward Jackson in the development of the technique and the teaching of refraction, it seems advisable to review some of the steps which led to our modern knowledge of the subject.

Much of the important work on refraction originated in England and in the United States. One important exception is the famous volume by Donders,<sup>5</sup> a clinician of Utrecht, Holland; but the complete form of this volume first came before the medical public in an English translation.

It is probable that the first type of refractive error to be subjected to anything like systematic correction was myopia. In 1629, Charles the First of England granted a charter to "The Worshipful Company of Spectacle Makers," one of the organizations which now confer upon British opticians certificates of proficiency in the measurement of optical defects of the eye. It will be remembered that Benjamin Franklin is said to have designed, in 1777, the first pair of bifocal spectacles.

For a long time the terms "presbyopia" and "farsightedness" were used synonymously. The development of a knowledge of astigmatism is relatively recent. Thomas Young, the English physicist, is credited

with the first scientific observation of this ocular defect, correction of which now occupies so large a part of the time of almost every conscientious and well-qualified ophthalmologist.

On November 27, 1800, Thomas Young, M.D. and Fellow of the Royal Society, delivered before that Society his Bakerian lecture<sup>22</sup> "On the mechanism of the eye." In that lecture Young described the optical condition of his own eyes, together with certain means of measuring the condition, including a simple optometer. He was strongly myopic as well as astigmatic.

"My eye," he says, "in a state of relaxation, collects to a focus on the retina, those rays which diverge vertically from an object at a distance of ten inches from the cornea, and the rays which diverge horizontally from an object at seven inches distance." Further on he remarks: "The shortest distance of perfect vision in my eye is 26 tenths of an inch for horizontal, and 29 for vertical rays." He adds that he has never experienced any inconvenience from this imperfection! Elsewhere, reference is made to the fact that "Many persons were obliged to hold a concave glass obliquely, in order to see with distinctness, counterbalancing, by the inclination of the glass, the too great refractive power of the eye in the direction of that inclination. . . ."

Young's astigmatism was exceptional

\* Presented at the forty-ninth meeting of the American Academy of Ophthalmology and Otolaryngology, October 8-12, 1944.

in two respects. It was what we call inverse, the horizontal meridian having the stronger plus focus. It appears also to have been chiefly lenticular, for one of Young's experiments on his own eye showed that his astigmatism was not abolished when the cornea was immersed in water.

One of Young's scientific activities in relation to the eye consisted of refuting the current belief that the crystalline lens contained muscle fibers. For modern research workers there may be consolation in the following incidental confession of a great scientist: "I beg leave," he says, "to correct here an observation in my former paper, relative to the faint lateral radiations, which I supposed to proceed from the margin of the iris. I find, on further examination, that they are occasioned by reflections from the eyelashes."

Little practical benefit seems to have followed Young's description. But in 1827 Airy,<sup>1</sup> the British Astronomer Royal, reporting before the Cambridge Philosophical Society, described his own case of compound myopic astigmatism and the means taken for its correction. He had observed that the image made in his left eye by a bright point, such as a star or a distant lamp, was not circular but elliptical, the major axis being 35 degrees from the vertical, its upper extremity inclined to the right. He found that, if he drew two lines crossing each other at right angles and placed the paper at a proper distance, one line appeared perfectly distinct while the other could scarcely be seen. On bringing the paper closer to the eye the relation between the two lines was reversed. After "various ineffectual attempts" the construction of the necessary cylindrical lens was accomplished by an Ipswich optician named Fuller, a concave spherical curvature being ground on one side of the lens and a concave cylindrical on the other.

Airy seems to have made one mistake. Toward the end of his short report he says: "I have not been able to discover that this construction has been used to correct any defect in the eye, or even that a defect similar to that which I have described, has ever been noticed." Thus Airy appears to have been unfamiliar with the observation made forty years earlier by Thomas Young.

How many recognized cases of this sort escaped notice in the medical literature, or in that part of it which has been accessible to me, I cannot say. Under the head of "Particular kinds of nervous affections," the first edition, 1833, of "A treatise on diseases of the eye," by the British surgeon William Lawrence,<sup>17</sup> mentions nearsightedness and farsightedness but makes absolutely no reference to astigmatism. An American edition of Lawrence's work, edited in 1854 by Isaac Hays, Surgeon to Wills Hospital, quotes at length the account by an American clergyman of his own case of astigmatism, which is said to have been corrected with lenses furnished by a Philadelphia optician named McAllister.

In these early cases the estimation of the meridians of astigmatism seems to have been arrived at by the simple expedient of discovering the direction of distortion of the image of a light seen through a small hole in a black card. One supposes that the conclusions as to the meridian or axis, and as to amount of cylinder, may have been somewhat crude.

The section of abstracts of communications to the British Association for the Advancement of Science for the year 1849 contains a brief communication<sup>21</sup> by Professor Stokes, the well-known mathematician and physicist, "On a mode of measuring astigmatism in a defective eye." This ingenious device, which may to some extent be regarded as the basis of the Jackson cross-cylinder test

for the amount of astigmatism, is described in the following terms: "If two planocylindrical lenses of equal radius, one concave and the other convex, be fixed one in the lid and the other in the body of a small round wooden box, with a hole in the top and bottom, so as to be as nearly as possible in contact, the lenses will neutralize each other when the axes of the surfaces are parallel; and, by merely turning the lid round, an astigmatic lens may be formed of a power varying continuously from zero to twice the astigmatic power of either lens. When a person who has the defect in question has turned the lid till the power suits his eye, an extremely simple numerical calculation, the data for which are furnished by the chord of double the angle through which the lid has been turned, enables him to calculate the curvature of the cylindrical surface of a lens for a pair of spectacles that will correct the defect of his eye."

One form of the Stokes lens is depicted on page 486 of the English edition of Donders. At the 1887 meeting of the American Ophthalmological Society, held in New London, Connecticut, W. F. Dennett<sup>3</sup> of New York described and illustrated a special form of the Stokes lens, intended for mounting in a trial frame, and designed to permit not merely of variation in the strength of the cylinder but of adjustment of its principal meridians to any position in the trial frame. Dennett's introductory paragraph seems worth quoting. He says: "The Stokes lens seems hitherto to have been possessed of some intangible and unattainable value, as an astigmometer. There are at least four different instruments, the independent inventions of as many different men, in which this lens is the principal factor, but up to the present time it has ranked as little better than an interesting toy."

It is advisable to repeat and to emphasize that the Stokes lens served merely to give an approximate measurement of well-marked astigmatic errors, upon the basis of an axis previously established by other means, or sometimes by turning of the whole apparatus in the hand of the patient or observer.

In the course of the present address, further reference will be made to Jackson's teachings with regard to cross, or crossed, cylinders. But it may be observed at this point that his work in this field is typical of Jackson's general relation to medical science. To very few medical workers is given the privilege of offering to the world something completely new. In fact, it may be said without contradiction that every new thought or invention is based upon the sum total of previous human knowledge in the given field. But Jackson surveyed every department of his chosen work with penetration and insight and with unremitting labor; and in several phases of refraction work, including the measurement of astigmatism with cross cylinders, he made important refinements and improvements upon what had been proposed by others.

The period of greatest advance in measurement of the refraction of human eyes will be forever associated with the name of F. C. Donders. This clinician's researches at the University of Utrecht led to his publishing in 1860, in the Dutch language, an essay upon "Ametropia and its results" (*Ametropie en Hare Gevolgen*). In the preface to that work the author announced his intention of producing a complete system of the anomalies of refraction and accommodation, including the subject of astigmatism. A little later Donders was requested by the New Sydenham Society, of England, to prepare his essay for an English edition. He responded with a treatise of about six hundred pages in which the whole sub-

ject was exhaustively covered. The manuscript was ably translated by William Daniel Moore of Dublin.

Since the time of Donders, differences of opinion and changes of technique have developed; but as to essentials it is difficult to find any branch of the subject that is not included in the scope of Donders's thought and experience. His volume even has something to say about aniseikonia, although not under that title. Some years ago I ran across a statement that biastigmatism, or the occurrence of distinct and usually conflicting astigmatisms in the cornea and the crystalline lens of the same eye, had been first discovered in or about 1909. I had little difficulty in confirming my suspicion that Donders had clearly referred to this phenomenon in 1864 in his work on accommodation and refraction. He also quite correctly pointed out that bicylindrical lenses, with intersecting axes, could always be advantageously replaced by spherocylindricals.

You will remember that Jackson's brief period of practice of general medicine was cut short by an attack of diphtheria which was followed by many months of incapacity from postdiphtheric paralysis involving the leg muscles and ocular accommodation. It was during this spell of physical incapacity that he familiarized himself "through and through" with Donders's epoch-making working.

What contrasts may we find between refraction before and after Donders? Or again, what changes did the refractive technique of Jackson's active years show in comparison with the precepts laid down by the Dutch teacher?

In the field of ophthalmology, the textbook of William Mackenzie<sup>18</sup> seems to have filled, for many years, much the same authoritative and universal position as has been occupied in modern times by William Osler's "Practice of medicine."

Mackenzie was "Lecturer on the Eye in the University of Glasgow, and one of the surgeons of the Glasgow Eye Infirmary"; later "Surgeon-Oculist in Scotland to her Majesty" Queen Victoria.

Mackenzie's first edition was published in England in 1830. A first American edition, containing 719 pages, appeared in 1833. The fourth American edition, published in Philadelphia in 1855, had 1,027 pages of larger size.

It is not altogether surprising that the 1833 and the 1855 editions of Mackenzie's treatise devoted extremely little space to refractive errors. Even in the fourth edition, asthenopia, considered as a disease, was attributed to many causes, among which refractive error fails to be included. Myopia and presbyopia were contrasted as two opposite conditions, approximately as myopia and hyperopia are contrasted today. We are, however, told that "young men of twenty sometimes cannot see to read or write without convex glasses of six or eight inches focus."

As to astigmatism, the earlier English edition of Mackenzie is silent. In the 1855 American edition, the two-and-a-half pages devoted to an explanation of astigmatism are chiefly occupied with a record of the famous case of the astronomer Airy. Mention is made of the clergyman Whewell's proposal of the word "astigmatism," also of the several cases which had been published in the literature, and of the Stokes lens.

Speaking in 1833 of "presbyopia or farsightedness," the English surgeon and ophthalmologist Lawrence advises that glasses for its correction "must be chosen . . ." so as to "enable the person to see without straining or fatiguing the organ, and should only be worn for reading, writing, or examination of near objects."

By both Mackenzie and Lawrence a good deal of space was devoted to dis-

cussion of asthenopia and theories as to its causation. Mackenzie was quite pessimistic on the subject. "In many cases," he said, "it is our duty to declare the disease incurable. . . . Many a poor man have I told to give up a sedentary trade, and drive a horse and cart; while to those in better circumstances, and not far advanced in life, I have recommended emigration. . . ."

Donders, commenting on some further remarks by Mackenzie, says: "There is no doubt that Mackenzie gave far too weak glasses." While admitting that many other conditions had often been mistaken for asthenopia, Donders boldly asserted that the cause of "the pure form of asthenopia" lay in hyperopia, and that asthenopia was not the fatigue associated with looking at other objects, but the want of power through which the fatigue occurred.

Reference may be made to what Donders stigmatizes as "a melancholy page in the history of operative ophthalmic surgery," the fact that certain practitioners, attributing asthenopia to spastic contraction of external eye muscles, "had the courage to cut through the muscles." This practice Donders justifiably characterizes as belonging "to the fables of the period of operative mania."

The correction of myopia-with spectacles is usually thought of as a rather simple matter. In earlier times, its understanding and the practical results obtained were commonly much complicated by complete, or almost complete, ignorance regarding astigmatism, since the myopic eye with an appreciable amount of astigmatism could not be perfectly corrected with a simple concave sphere.

We find Lawrence, in 1833, advising his readers that "from the use, under proper precautions, of such concave glasses as will rectify the error in the refractive power, the nearsighted person

need not apprehend any injury to the eye; indeed, the easy exercise of vision with the recognized optical aid, seems to me less hurtful than the straining and efforts to do without it." But he adds: "As there is some reason for concluding that the optical powers accommodate themselves to the circumstances under which vision is habitually exercised, I recommend nearsighted persons not to wear spectacles constantly. . . ."

Since in 1854 the American edition of Lawrence quotes at a good deal of length from Mackenzie's discussion of refraction, the latter British writer may probably be considered typical of opinion in Great Britain and America at the middle of the nineteenth century. For the myopic patient Mackenzie recommends "frequent exercise out of doors, walking and riding in the country, and travelling through new and interesting scenes." "If," he says, "instead of such a plan of conduct, recourse be had to the employment of concave glasses, and the frequent and long-continued observation of near objects be persisted in, the disease becomes not only confirmed but sometimes greatly aggravated. . . . We must recommend to the nearsighted person to be content with the shallowest glasses or lowest number which answers his purpose. . . . When a nearsighted person wishes to be fitted with concave glasses, the simplest and shortest plan is to try a series of them at an optician's shop. . . . If the nearsighted person is desirous of assistance in seeing remote objects . . . the focal distance of the glasses . . . should be the distance at which a small object appears distinct to his naked eye. For example, if he reads this type at 12 inches distance, 12 inches will be the focus of the concave glasses which he will require for seeing distant objects distinctly."

Hays, the American editor of Lawrence's fourth edition, has progressed to

the point of declaring that "presbyopia is not a defect of old age alone, it occurs also in young persons; and, if we may judge from the number of examples of this which have come under our observation, much more frequently than is generally supposed." A footnote to the same chapter states that "convex glasses are kept in the shops of every focal length, from forty-eight inches to six."

Donders clearly stated the refraction of the eye to be its refraction in the state of rest, "independently of accommodation . . . for example under the influence of atropine."

By the time Donders's volume was written he had the benefit of a few years of experience in the truths revealed by the ophthalmoscope. To him, the prescribing of spectacles had become a part of ophthalmic surgery. He tells us about refraction with the ophthalmoscope. He still used the inch system for numbering the focus of spectacle lenses. He speaks of a former belief that myopia was the normal condition of the human eye, and states that hyperopia had been "until quite recently almost entirely overlooked, at least its nature and results were not recognized. But once discovered and understood," he says, "it speedily revealed all its mysteries, and gave us the key to a number of phenomena. . . . Thus the source of asthenopia and of strabismus convergens was found in this anomaly."

Donders's preliminary estimate of the amount of myopic correction required was made by placing in the hand of the patient a book with small type, with which the patient was to indicate his farthest point of distinct vision. The patient was then to remove the book a little farther until the letters were rather less distinct. But Donders warns that "experience has taught me that we cannot be too cautious, for with good accommoda-

tion the action of too strong glasses is easily enough overcome. . . ."

We find in Donders several evidences of a prejudice against what the author calls "complete neutralization of myopia," in other words its complete correction. This is hardly surprising when we remember that probably most of the myopic patients had uncorrected astigmatism which easily became a source of eyestrain. Thus we are told that in certain cases the use of glasses is dangerous "and must be discontinued, so soon as it appears that the myopia is particularly progressive." Again, "in very slight degrees, from 1/60 to 1/18" [that is, from about 2/3 to 2.25 diopters] "we may leave the myope to himself." Further, "in the higher degrees, from 1/5" [that is, 8 diopters] "upwards, perfect neutralization is not pleasant for close work because . . . the images become too small." In such cases Donders would correct 3.25 to 2.50D., wearing for distant vision a lorgnette held before the spectacles. He remarks that the idea that there is anything injurious in this combination is an unfounded prejudice.

Even today in the United States it is still customary with some ophthalmologists to undercorrect myopia in the fear of throwing an excessive strain upon the patient's accommodation, and I believe I am right in saying that this tendency is carried much further in most European countries than in our own.

In the study of hyperopia, Donders, like many modern workers, was much disconcerted by the problem of latent hyperopia. He says: "In my first investigations respecting H, I encountered the difficulty of accurately determining the degree of this anomaly . . . I assumed that hypermetropic eyes, obliged to put their power of accommodation upon the stretch in order to see remote objects,

sometimes involuntarily to a certain degree kept up the tension, even when the proper glasses rendered this not only superfluous, but undesirable for accurate vision. Therefore, from the strongest glasses, with which the eye had, at different trials, still seen accurately at a distance, the degree of H was reduced. This should, as I supposed, completely neutralize the H. But when shortly afterwards, still stronger glasses were sometimes found adapted to the same persons, I discovered my error, and comprehended that those first given had not completely neutralized the H, and that in using them the accommodation to a certain degree continued in operation." Thus Donders was led to study the situation under atropine, and to his surprise found that not infrequently the greater part of the H had been suppressed. This led to the discovery that moderate degrees of H might be wholly suppressed, especially in cases of asthenopia and strabismus.

In this connection two comments seem to be called for. In the first place the examination for hyperopia, in Donders's days, must have been complicated by the fact that Snellen's recently introduced form of letter chart had not yet been generally adopted, and that it was still a very usual custom to measure the patient's far point by varying the distance of test letters from the patient, instead of depending upon variations in size of letters read at a fixed distance. The second comment is that in the earlier literature I have been unable to find any reference to the fogging method, and especially to bilateral fogging, by means of which it is now possible in most cases to uncover approximately the whole hyperopic error before using cycloplegia.

As regards the former observation, it is peculiarly interesting to note that the custom of three quarters of a century ago

is persisted in by one of our most useful and necessary public institutions, the United States Navy, which still measures the distance at which the patient or candidate can recognize certain letters or signs, instead of having him read progressively smaller letters on a Snellen chart at a fixed and remote distance. It is true that the visual standards in the Navy lessen the harmfulness of this antiquated method, which in ordinary practice would have the substantial disadvantage of ignoring the influence of uncorrected myopia upon the statements of visual acuity.

It was the remarkable practice of a number of writers before Donders to treat asthenopia by first prescribing convex lenses and then, after an interval in which the patient was denied the use of his accommodation in close work, to weaken the spectacles gradually, and at the same time to permit gradually increasing application to close work. We cannot but agree with Donders's skepticism as to the success of such a course of treatment. And it is no wonder that, as we have seen, Mackenzie admitted he found it his duty in many instances to declare the asthenopia incurable!

Thus, as to the three great factors in refraction work, we see that Donders's attitudes were as follows: In myopia he was generally averse to full correction. In hyperopia he had made some steps toward recognizing the need for full correction, so far as near work was concerned, but hesitated to ask the patient to wear his correction for distant vision. As regards astigmatism, he was still using methods of measurement which were primitive as compared with those available today, and he hardly recognized the necessity for correcting astigmatism of less than one diopter. Since amounts of astigmatism which we now regard as significant enter into the correction of most



cases of hyperopia and myopia, we can see that the great majority of patients suffering from visual defects correctable by glasses either were given inadequate correction or failed to obtain any.

Since about fifteen years elapsed between the publication of Donders's work in English by the New Sydenham Society and Jackson's entry into practical ophthalmology, it is obvious that a good many American professional men must have studied the problems of refraction before Jackson's light began to shine. Noteworthy among these are H. Derby,<sup>4</sup> of Boston, and the elder John Green,<sup>6</sup> of Saint Louis. The latter showed a very special interest in tests for astigmatism.

In 1867 Green published in the *American Journal of the Medical Sciences* an excellent paper entitled "Detection and measurement of astigmatism," with illustrations of three astigmatic dials of his own design. One of these had sixty radiating lines whose selection was aided by Roman numerals corresponding to the hours of the clock.

Jackson's important contributions to the art of refraction may be practically divided into two groups, the one dealing with the principles upon which refractive corrections were to be measured and prescribed, the other concerned with improvements in technique.

As regards principle, the Jackson of the early eighties naturally began at the stage of development which had been reached by teachers and colleagues, the most important of the former being Donders. But, as Jackson carried on the practice of ophthalmology in the clinic and in his private office, he tended to investigate for himself the principles laid down by others, and to discover where these principles were faulty or incomplete.

It is unfortunate that history cannot record the lively interchange of ideas

and experiences which must have gone on between the ophthalmologists of those years, particularly in Philadelphia.

The basis of Jackson's attitude toward correction of myopia and hyperopia is expressed in several papers. One of these,<sup>8</sup> "The full correction of ametropia," was read in 1891 before the Section on Ophthalmology of the American Medical Association; the other,<sup>9</sup> "The full correction of myopia," in 1892 before the American Ophthalmological Society. We find Jackson's logical mind impressed by the fact that the emmetropic eye is generally thought of as the ideal eye, and that "when an ametropic eye suffers from strain, one of the most important things that can be done for it . . . is to give it the optical aids that will make the conditions under which it works more nearly approach those of the emmetropic eye."

The fact that many of his colleagues did not follow this logical train of thought to its legitimate results was attributed by Jackson to several reasons. The first was that the new conditions caused by the wearing of correcting lenses always required a period of adaptation, particularly as regards the act of binocular vision. But he argued that in the long run, and apart from certain exceptional conditions, this period of adaptation was likely to be less protracted and less annoying when the correction for ametropia was complete than when it was partial. He stated that with due co-operation on the part of the patient he had never seen a case of so-called ciliary spasm that did not yield, so as to allow of perfect distant vision with the total correction, within two months of constant wearing of the glasses, and only two such cases that did not yield within two weeks.

However, and here is a point with re-

gard to which the textbooks are still generally at fault, the Jackson of 1891 points out that "the best correction at 4 or 6 meters is not the correcting glass for the total H., but is an overcorrection of  $1/4$  or  $1/6$  D."; continuing: "I know of no treatise on this subject that takes this into account." The practical significance of this fact is, of course, that, using Jackson's words, "patients given a 0.25D. overcorrection will not become accustomed to it and see clearly at a distance in any length of time. This inaccuracy must be avoided if you are going to correct the total H." Other conditions to which Jackson then called attention as affecting the result are the aberration of the eye and the necessity for fully warning the patient in advance of the early difficulties he may experience.

As to myopia, the Jackson of 1891 was merely one of a number of ophthalmologists who had reached the conclusion that it was usually preferable to give full correction for myopia. One of his colleagues, George C. Harlan of Philadelphia, who discussed the subject in a separate paper,<sup>7</sup> speaks of being encouraged to bring up the topic by Jackson's "temerity" in dealing with so trite a subject; and this suggests the comment that Jackson never hesitated to bring up a subject which some might think trite, but in regard to which many misconceptions and superstitions still existed among the profession.

Harlan's paper recalled how at the International Congress in New York, in 1876, a member had inquired concerning the practice of his colleagues as to the constant correction of myopia, and that a youthful ophthalmologist had been heard to mutter contemptuously, "Why does he take the time of the Congress with that? Why don't he read his textbook?" And Harlan remarked that that

was probably just what the inquirer had been doing, and that it was the unsatisfactory result of this investigation that led to the question!

Jackson asserted that, contrary to many previous statements, he and others had more recently convinced themselves that the power of accommodation was usually as great in myopes as in hyperopes of the same age. He also called attention to a fact too often overlooked, namely that undercorrection of myopia instead of avoiding eyestrain often induced it, because the undercorrected myopic patient is likely to look obliquely through his lenses in order to increase their effect, and by so doing creates an artificial astigmatism.

Many years later Jackson returned to the same subject in a lecture<sup>10</sup> delivered at the Philadelphia Polyclinic. He here condemns the assumption "that to leave uncorrected a part of the refractive error when prescribing will not seriously lessen the benefit. This assumption," he continues, "involves two errors. First, that all persons can overcome ametropia without feeling worse for it; and second, that the altered ametropia created by a partial correction will be as well tolerated as the same amount of ametropia arising during the development of the eye, and to which the patient has always been accustomed." In this paper Jackson recalls the case of a physician of robust physique, past fifty years of age, "who suffered from dizziness and nervous dyspepsia; and who was only relieved by the constant wearing of his correcting lenses:

R. + 0.37  $\subset$  + 0.25 cy.

L. + 0.25 sph."

Jackson's studious and critical contributions to refractive technique dealt particularly with the relative value of the ophthalmometer, with the principles and practical employment of the shadow test,

and last but not least with the testing of amount and axis of astigmatism by means of the cross cylinder. In 1887 he described his refraction ophthalmoscope,<sup>11</sup> but, however convenient within certain limitations the design of this instrument was, the use of the ophthalmoscope for refracting seems never to have established itself very firmly, although much favored by Loring.

Jackson's paper<sup>12</sup> on "The value of the ophthalmometer in practical refraction work," read before the American Ophthalmological Society in 1894, emphasized the fact that this apparatus measured only the corneal astigmatism, and he presented a statistical analysis to show that in three fourths of the cases corneal did not correspond to total astigmatism, that in almost one half of the cases the ophthalmometer was misleading as to the meridians of the total astigmatism, that determination of the direction of the astigmatism with the ophthalmometer was especially apt to be uncertain where the amount of the astigmatism was less than 0.50D., and that as a means of approximating the probable amount and meridians of total astigmatism it was greatly inferior to skiascopy among objective methods, and distinctly inferior to various subjective tests.

Jackson's detailed study of the shadow test,<sup>13</sup> first published in 1895, is one of the best productions of American ophthalmic literature. He had published two important articles on the subject in 1885 and 1886, the former in the American Journal of the Medical Sciences, the latter in the Journal of the American Medical Association. The shadow test, first described by Cuignet in 1875, had gradually come into use in France and England. But Jackson acknowledged in 1885 that he had been able to find only a single brief and inadequate description of it that had

been published on this side of the Atlantic.

Most advocates of the method had recommended its use with the concave mirror, the concave mirror of the ophthalmoscope being usually employed. Jackson pointed out the distinct disadvantages of the concave and recommended the plane mirror, particularly with a small source of light. Loring had apparently dismissed the method "as of no practical importance."

As already indicated, the cross-cylinder combination referred to earlier in this address as having been devised by the English physicist Stokes, and later modified by Dennett and others, was a rather cumbersome contrivance whose purpose was to make a rapid variation in the amount of cylindrical lens held before the eye.

In 1887 Jackson read<sup>14</sup> before the American Ophthalmological Society a paper describing "a trial set of small lenses and a modified trial-frame." This trial set employed planospherical and plano-cylindrical lenses of 1-inch diameter. In the course of the paper, Jackson included the following paragraph: "Astigmatic lenses have been added. The astigmatic lens, as described by Stokes, has with regard to one axis the action of a concave cylindrical lens; and in regard to the axis perpendicular to the former, the action of a concave cylindrical lens of equal refractive power. Such a lens is made by combining either convex or concave cylindricals, of equal refractive power, with axes perpendicular; or a spherical of one kind with a cylindrical of the other kind of twice the strength. The two used in this case are:

$$\begin{aligned} & - 0.25 \text{ sph. } \bigcirc + 0.50 \text{ cy.,} \\ & \text{and } - 0.50 \text{ sph. } \bigcirc + 1 \text{ cy.,} \end{aligned}$$

of which the former is most generally useful. For two years I have used such a lens to hold in front of the approximate

correction, to determine if a cylindrical lens or a modification of the cylindrical already chosen will improve it; and it is far more useful, and far more used, than any other one lens in my trial set."

He then went on to describe an illustrative case. His earlier technique seems to have been to revolve the axis of the cross cylinder over a semicircle, and I believe that the only handle possessed by the two cross cylinders mentioned was the sort of handle attached to every other lens in the trial case. No drawings were given in explanation of the lenses and the technique of their use.

E. E. Maddox of Bournemouth, England, gave the cross-cylinder test for amount of astigmatism enthusiastic mention in a volume<sup>19</sup> called "Golden Rules of refraction"; and Schneideman<sup>20</sup> of Philadelphia discussed the subject very briefly in 1900. But Jackson made little further reference to it in print until the appearance of a paper<sup>15</sup> read before the Colorado Ophthalmological Society in 1907, under the title "Astigmatic lens (crossed cylinder) to determine amount and meridians of astigmatism."

In that article Jackson gave his first printed account of the axis test with the cross cylinder, with the following introductory remark: "Especially strange does it seem to me that I employed such lenses for twenty years, to estimate the strength of the cylinder, without appreciating their great superiority for fixing the direction of the axis, although for several years I had occasionally employed them for this latter purpose." This article contained a couple of drawings to show the effect of crossing equal and like cylinders with their axes 45 degrees apart.

In my earlier years I had the distinct impression that both cross-cylinder tests, and especially that for the axis of astigmatism, were chiefly used by the relative-

ly few who had had the benefit of direct personal demonstration by Jackson. It was this impression, and experience in teaching the test during the Summer Course in Ophthalmology which Jackson had initiated in connection with the Colorado Ophthalmological Society, which led me to present my photographic demonstration before the International Congress of Ophthalmology in Washington in 1922.

The papers I have mentioned seem to me the most significant of Jackson's writings regarding refraction. There were many others, chief of them perhaps one read before the American Ophthalmological Society in 1888, "Symmetrical aberration of the eye,"<sup>16</sup> that is, the variations in curvature which occur, not as between meridians, but from center to periphery. Jackson had at first called the condition "meridional astigmatism," but the expression was properly criticized by Burnett and the elder John Green as likely to lead to confusion. This condition, Jackson's paper points out, is extremely important in regard to the technique and reliability or otherwise of skiascopy, as to some of the differences between refraction without and with cycloplegia, and as to the patients in whom it seems absolutely impossible to secure definite and consistent results concerning refractive measurement.

I have been disposed to think that Jackson displayed rather scant appreciation of the value of the better sort of astigmatic dials, the technique of which has been so ably elaborated by Lancaster and others. I believe, however, that he did occasionally use such dials in his own office practice.

The philosophy of Jackson's teachings with regard to refraction was built upon his conception of the importance of refractive measurement in the life of the

citizen, upon the belief that emmetropia was the goal to be sought in prescribing the distant correction, and upon the need for the utmost possible precision in the work of the refracting ophthalmologist, both in the interest of the patient and in the interest of the profession. His well-known activities in the direction of standardization of education for ophthalmic practice have been reviewed elsewhere.<sup>2</sup>

He always placed his sense of duty as a teacher ahead of the demands of daily practice. He personified the thought that the value of a man's life does not lie in the extent of his financial accumulations but in the knowledge of work well done, of lessons well learned and handed on to others, in the richness of his experience and the sincerity of his purpose.

*530 Metropolitan Building.*

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# MYASTHENIA GRAVIS AND ITS OCULAR SIGNS: A REVIEW\*

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The primary purpose of this paper is to evaluate our present state of knowledge regarding the ocular signs of myasthenia gravis. However, it is quite impossible to appreciate the ocular symptomatology without having a general knowledge of the disease and of its treatment, for this is one disease in which diagnosis and treatment are largely dependent upon the use of a single drug, *prostigmine*.

## I. GENERAL REVIEW

*Pathology.* Since Weigert's original description of collections of lymphoid cells in the muscles and changes in the thymus, relatively little has been added to our knowledge of the pathology (figs. 1, 2, 3, 4).

Collections of lymphoid cells in the muscles or the absence of such cells does not indicate the severity of the affection. Buzzard termed these cell accumulations "lymphorrhages," and this term has come into general use. We have observed cases in which lymphorrhages were numerous and others in which they occurred in some sections of the muscles but not in others. It seems altogether likely that in any case of myasthenia gravis if a sufficient number of sections are examined, some of these cell nests may be found between the muscle fibers and around the blood

vessels. In addition they may be found in the heart, liver, endocrine glands, salivary glands, and lungs (Wilson). According to Rottino and others myocarditis may be part of the pathology of myasthenia gravis. Their case exhibited areas of necrosis with secondary inflammatory changes in the heart, a finding described as entirely unlike lymphoid-cell infiltration.

Myasthenic muscles may undergo slight changes in the increase of sarcolemma nuclei, fatty infiltration, hyaloid appearance, or, according to Wilson, the muscles may become small and pale. Whether or not structural changes amounting to complete atrophy occur is a point on which there is not general agreement, but if so pronounced a change does occur, it might well be observed in the ocular muscles.

As regards the thymus in myasthenia gravis, it has been known for a long time that thymus tumor may be associated with the disease, or that there may be hypertrophy of the thymus gland. Thus, Bell, in 56 autopsied cases, found that the gland was hypertrophied in 17 and that tumor was present in 10 instances. From such reports it was reasonable to assume that thymus changes were significant only when tumor or hypertrophy of the gland was present. Recent observations by Blackman and by Sloan seem to establish as constant, changes in the thymus even when there is pronounced and normal involution of the gland. These changes consist of an infiltration of the medulla with lymphocytes and an increase in the relative width of the cortex, which becomes packed with lymphoid cells. The differentiation between the cortex and the medulla of the gland is lost. Lymphoid

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This paper has been based on case reports and these and parts of the text which have been deleted may be found in the Transactions of the American Ophthalmological Society of 1943.



Fig. 1 (Walsh). Section of muscle showing collection of lymphocytes (Aut. 17768).

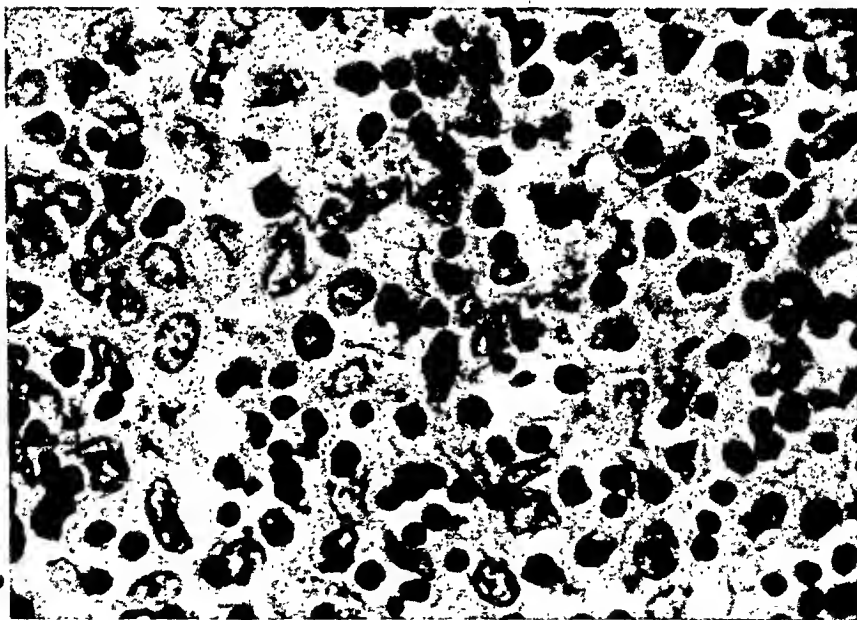


Fig. 2 (Walsh). Thymus tumor (high power). The section shows cells of two types: (1) smaller lymphocytes; (2) sheets of large epithelial cells. In general the proportions of these cells vary. The division into lobules separated by fibrous septa is not shown (Aut 17768).

follicles with germinal centers are present in the medulla.

Sloan examined the thymus in cases of Addison's disease, acromegaly, and hyperthyroidism. In three of seven cases

of Addison's disease, and in two of five cases of acromegaly, the histologic picture was similar to that seen in myasthenia gravis. In 20 thymus glands removed from individuals with hyperthyroidism

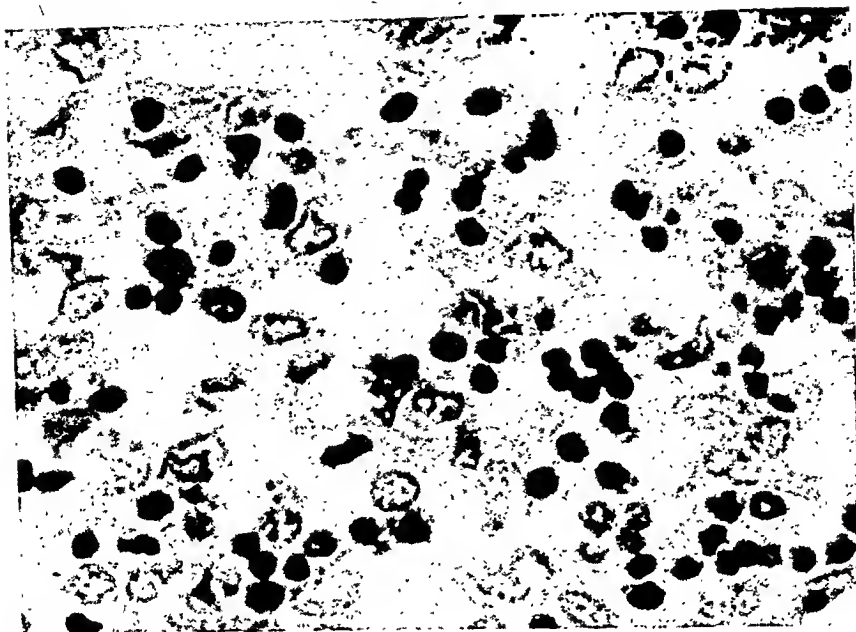


Fig. 3 (Walsh). A metastasis. Metastases are the same as the primary tumor, but often contain large channels filled with blood. Such channels are sometimes present to a less degree in primary tumor of the thymus. In this case the metastases were present in the visceral and parietal pleura of only one side.

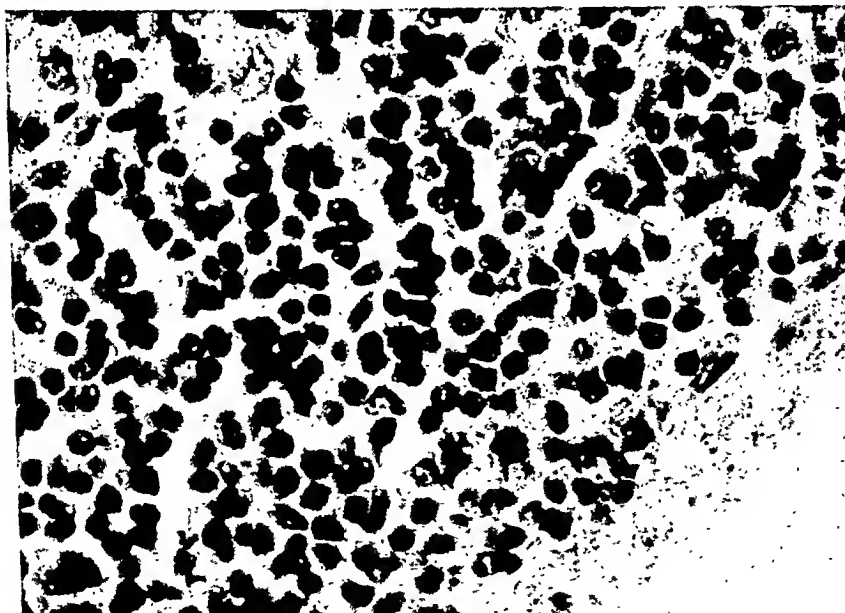


Fig. 4 (Walsh). Hyperplasia of the thymus. Note the pronounced hyperplasia of the cortex and the presence of many germinal centers.

there was lack of involution in 18 cases, and in the remaining five the changes were similar to those seen in myasthenia gravis.

In the central nervous system, in a

great majority of cases, there is no involvement. McAlpine has described slight lymphocytosis in the brain stem, with perivascular infiltration and hemorrhages into the gray matter. He suggested that



these findings pointed to an occasional relationship between myasthenia gravis and epidemic encephalitis.

*Occurrence.* That myasthenia gravis is not a rare disease is evidenced by the number of cases which form the basis for this report. Before prostigmine became available, the diagnosis was frequently missed. Thus Viets remarked that in the Massachusetts General Hospital up to 1935 the diagnosis of myasthenia gravis was made about once a year, whereas from 1934 to 1941, 84 cases were so diagnosed. Our experience in the Johns Hopkins Hospital has been similar.

The sexes are about equally affected. In the series reported here there were 27 males and 36 females, and of these, 50 were white and 13 were colored. There were 22 white males and 28 white females, 5 colored males and 8 colored females. As regards the age incidence, the earliest age of onset was 11 months and the oldest age at onset of the disease was 75 years. The occurrence according to decades was: 0 to 10 years, 5 cases; 10 to 20 years, 10 cases; 20 to 30 years, 13 cases; 30 to 40 years, 19 cases; 40 to 50 years, 5 cases; 50 to 60 years, 7 cases; 60 to 70 years, 3 cases; 70 to 80 years, 1 case.

Heredity rarely appears to play a role, and no example was recorded among our cases. Noyes has reported the affection in a father and two daughters, Marinesco in two sisters, Hart in two siblings, and Rothbart in four brothers of a family.

The occurrence of myasthenia gravis in infancy and early childhood has always been questioned (by Kinnier Wilson among others). Consequently the observation of five cases in children below 10 years of age merits particular attention. Four of these five cases were in Negro children under six years of age. It is interesting to note that the affection may begin at as early an age as 11 months.

Booth (1908) recorded a case at 23 months, and Kawaichi and Ito (1942) one at 21 months. It seems remarkable that it may begin at the age of 75 years, as in Case 61, where the diagnosis was established when the patient was 82 years old.

*Contributing factors.* It is impossible completely to evaluate exciting or contributing factors, since we do not know the etiology of the disease. There can be no doubt regarding the frequency with which the affection first manifests itself after a respiratory infection, since exacerbations are commonly observed as the result of such infections. The onset may be influenced by normal labor; its course may be affected by pregnancy, usually favorably (Viets and others), but not always so. Myasthenia gravis does not interfere with normal labor (Laurent). We have observed the development of myasthenia after ptomaine poisoning, after severe dog bites, and in association with urticaria.

In a great majority of cases there does not seem to be any exciting or contributing factor.

*Associated conditions.* Hysteria or emotional outbursts have been mentioned in several cases that have come under our observation. We have seen it in patients who exhibited signs of hyperthyroidism; in another patient who exhibited exophthalmos in the absence of signs of hyperthyroidism, and in association with diabetes. In one case there was evidence of the previous existence of anterior poliomyelitis or of some other disorder responsible for the smallness of one limb.

Curschmann reviewed particularly the possible role of the ductless glands in the production of myasthenia gravis, and concluded that in all probability endocrine disturbances were incidental rather than causative. He included congenital defects occurring in myasthenics, and observed it in two cases of aplasia of the female

genitals. He referred to the possible relationship of hyperthyroidism to myasthenia gravis, and was unable to obtain a myasthenic reaction in very severe cases of hyperthyroidism. Curschmann remarked that Marinesco had described hyperplasia of the hypophysis, and Tilney reported adenoma of the hypophysis in cases of myasthenia gravis.

*Etiology.* The nature of the fundamental disturbances responsible for myasthenia gravis is not known. All the available evidence, both clinical and experimental, points to the defect being in the muscles, and to the neuromuscular junction as the site of the disturbance. The evidence is necessarily incomplete and selective, since the literature is enormous and contains conflicting reports and complicated hypotheses.

Probably the earliest, and certainly one of the most productive, discoveries was made by Claude Bernard in 1857, when he found that mild curare poisoning will block impulses passing from nerve to muscle when both are capable of functioning. Because Walker recognized a similarity between paralyses of mild curare poisoning, and those of myasthenia gravis, eserine was used in the treatment of myasthenia gravis, since it was known to be a decurarizing agent.

Recently acquired knowledge which has an important bearing on the problem concerns the chemical transmission of nerve impulses (Dale, Cannon, and Rosenblueth among others). This work requires only brief mention here. It has been established that in the autonomic system there are chemical transmitter substances, acetylcholine and sympathin. It has been assumed that acetylcholine is the transmitter substance responsible for the contraction of skeletal muscle, and this has been substantiated, in part at least, by the finding of acetylcholine in eserinated perfusion fluid from skeletal muscles when

the motor nerve has been stimulated (Dale and Feldberg). As Dale has remarked, if acetylcholine is the chemical mediator which acts as a direct excitator of skeletal muscle fibers, it would have to appear with flashlike suddenness when an impulse reaches the motor nerve endings; then it would have to disappear within the brief span of the refractory period. It seems proved that eserine has a protective influence on acetylcholine through rapidly breaking down cholinesterases which hydrolyze acetylcholine. Prostigmine, a substance closely related to eserine, has been found to be more effective than the latter in the treatment of myasthenia gravis. However, as regards the action of eserine, it has not been established that it acts entirely by attacking the cholinesterases, and it has been found that it is capable of stimulating motor nerve endings; it has also been determined that cholinesterases are normal in myasthenia gravis (Jones and Stadie).

To continue with the evidence which seems to point to the causal factor of myasthenia gravis being associated with abnormality at the neuromuscular junction, there may now be considered the clinical effects of prostigmine, acetylcholine, and other substances in normal individuals and in those suffering from myasthenia gravis.

When injected into the brachial artery of normal individuals in amounts of 0.5 to 1.5 mg., prostigmine produces: (1) a profound paresis of the muscles in the injected extremity (a band is placed about the arm in order to make the injection); (2) fasciculations (twitchings, fibrillations) of the muscle fibers in the extremity and similar but less pronounced twitchings elsewhere after the tourniquet has been removed. Prostigmine similarly injected into the brachial artery or elsewhere in a person suffering from myasthenia gravis gives precisely opposite re-

sults; namely, (1) partial or complete return of motor power; (2) no fasciculations.

Acetylcholine when injected intra-arterially in amounts of 20 to 40 mg. in normal individuals produces transient weakness of the extremity. If injected into an individual with myasthenia gravis, it produces a sudden contraction of the injected muscles.

Quinine, a curarizing agent, when given to normal individuals, produces no change in muscle response. If given to an individual suffering from myasthenia gravis, there is a pronounced increase in the weakness of the affected muscles (Harvey and Whitehill). An exception to this generalization may have been observed in case 12, where only the ocular muscles were involved. This case has possible significance from the standpoint of myasthenia gravis in some instances affecting only the ocular muscles. It is further considered in part II.

Other substances which are said to have a decurarizing effect are potassium chloride, guanidine, and calcium chloride. The administration of these substances to individuals suffering from myasthenia gravis does not produce detectable changes (Harvey and Whitehill).

Much experimental work has been done in recording the effects of stimulation of muscles. The electromyograms of normal individuals have been compared with those of individuals suffering from myasthenia gravis both before and after the administration of various drugs.

In normal muscles, Cobb and his collaborators confirmed previous work showing that the frequency of the primary waves during contraction diminished from 40 to 60 per second, but that the amplitude increased; and that in myasthenic muscles the frequency did not diminish, but the amplitude was smaller at the beginning than in normal muscles and

rapidly diminished. These investigators observed that myasthenic muscle loses its contractile power before the onset of fatigue. Lindsley found that after intramuscular injection of prostigmine the myographic curves became practically normal. Harvey and Masland noted that the action potential recorded from the muscle of an individual suffering from myasthenia gravis was the same as that obtained from a normal individual when a single stimulus was applied. When responses to paired stimuli were compared, it became apparent that the response to the second stimulation was often smaller than that to the first, whereas in normal individuals there was no such difference. When the nerve was stimulated at low frequencies (50 per second or less), the muscle action potentials showed a rapid decline in voltage during the first few responses and then continued at lower levels of response. However, in normal individuals the muscle potentials showed little change.

From figure 5 it may be seen that following the administration of prostigmine the muscle action potentials became approximately normal. Harvey and Masland found increased abnormalities in myasthenics after the administration of quinine, but discovered that potassium chloride, guanidine, calcium chloride, and vitamin B<sub>6</sub> did not influence the electromyograms of individuals suffering from myasthenia gravis.

Harvey, Lilienthal, and Talbot studied five patients who had been subjected to thymectomy for the treatment of myasthenia gravis. They observed fasciculations in the muscles of three of these patients after the intra-arterial injection of prostigmine, and all three developed local paresis just as occurs in normal individuals. In these patients, all of whom had been favorably influenced by the operation, electromyograms showed that a large

number of muscle fibers responded and that there was greater efficiency in the transmission of pairs and trains of maximal motor-nerve stimuli.

Largely on the basis of the observations just mentioned, Harvey, Lilienthal, and Talbot concluded that in myasthenia gravis there is a deficiency of acetylcholine at the neuromuscular junction. This, in their opinion, accounts for the characteristic changes which they found in electromyograms. Their arguments were set forth as follows: (1) Prostigmine has a protective influence upon acetylcholine. (2) In normal individuals the injection of prostigmine intra-arterially produces local paralysis, and a similar result occurs from the injection of acetylcholine. Since precisely opposite results are obtained from the same procedures in patients with myasthenia gravis, it seems to follow that there is an insufficient amount of acetylcholine to provide for a depressant action. (Case 3 exemplifies such an unfavorable influence from the injection of prostigmine in an individual with myasthenia gravis. In this case large doses produced general toxic effects but increased the range of the ocular movements which had not been influenced by average doses.) (3) Finally, Harvey and his collaborators drew upon Cannon's theory of sensitization to a transmitter substance and assumed that if less acetylcholine is available, the threshold of the muscle for this substance is lowered.

The conclusions of Harvey and his collaborators seem to fit reasonably the facts so far as we know them, but they are, in part at least, based upon hypotheses which have not been completely verified. Many problems require more convincing proof than that available from the translation of electromyograms. It has previously been stated that there is some proof that acetylcholine is the transmitter substance responsible for the mediation of motor-

nerve impulses to skeletal muscles. However, other mechanisms may play a part in the transmission of such impulses. It has been observed that the intravenous injection of acetylcholine may produce slow tonic contractions of skeletal muscle (Bard), and it was maintained by Duke-Elder and Duke-Elder that there was likely to be selective involvement of the muscles attached to the eyeballs. This is difficult to understand if the skeletal muscles normally contract as the result of the flashlike appearance of acetylcholine, as suggested by Dale.

Furthermore, if the extraocular muscles are as sensitive to acetylcholine as Duke-Elder's observations imply, it is difficult to understand why these muscles, with the exception of the levator palpebrae, are particularly resistant to prostigmine in individuals suffering from myasthenia gravis.

#### GENERAL SYMPTOMATOLOGY

Myasthenia gravis is characterized by fatigability and weakness of the muscles. It is difficult, if not impossible, to prove that fatigability precedes weakness, but it seems probable that it does. The diagnosis rests essentially upon the demonstration of fatigability. Usually this is readily accomplished in individuals suffering from myasthenia gravis by repeated opening and closing of the eyes or mouth, counting aloud, opening and closing the hand, raising the leg, or other similar movements intended to tire the affected muscles. As a rule, the diagnosis is made easily, but in some cases it may be difficult to make.

*Ocular symptoms and signs.* In all cases in this series there were ocular symptoms or signs, and these were usually the earliest manifestations of the affection.

Diplopia is frequently the earliest symptom of the disease. It may be present where there is no visible evidence of

limitation of ocular movements, or it may be associated with ptosis or with muscle paresis. Ptosis, often bilateral, occurs frequently. Characteristically, it is absent or minimal in the morning, becoming more pronounced as the patient becomes fatigued. Limitation of ocular movements varies within wide limits, and often affects both eyes, but may affect only one eye or even a single muscle. Inability to close the eyelids tightly is frequently present; it may be associated with ptosis and with limitation of ocular movements. The ability to converge the eyes is often lost. In our experience, the pupils are not affected in myasthenia gravis. The visual acuity and visual fields are not altered. It seems highly questionable whether accommodation deficits can properly be attributed to myasthenia gravis.

*"Bulbar" signs.* Early writers referred to myasthenia gravis as asthenic bulbar paralysis (Strümpell) because of the following signs: Facial weakness, usually bilateral, is commonly present and was observed in 23 cases. This weakness lends a flat appearance to the face, and a smile seems more like a snarl, since the retractor muscles at the corners of the mouth are more severely affected than the elevators. Facial weakness is often associated with inability to close the eyelids tightly and with ptosis and paralyzes of the extraocular muscles.

Weakness of the jaw muscles, which was present in 10 cases, accounts for the inability to chew food properly, and often develops toward the end of a meal. In severe cases the lower jaw sags and can be elevated only by the aid of the hands. We observed a myasthenic who placed a rubber band around his head and jaw to keep the latter in position.

Weakness of the soft palate and pharynx produces difficulty or inability to swallow properly. In severe cases regurgitation of fluids through the nose occurs

(10 cases). Palatal weakness lends a nasal quality to the voice, which is readily demonstrated by asking the patient to count aloud. Weakness of the tongue and larynx adds to the difficulty in speaking, and if the laryngeal muscles are severely affected there is aphonia.

Weakness of the intercostal muscles and diaphragm is responsible for dyspnea and varies according to the amount of rest the myasthenic has had. In severe cases periods of respiratory distress come on, at first after tiring, later appearing spontaneously and without apparent cause. Occasionally respiratory distress is apoplectic in its onset, and respiratory failure is a common cause of death in myasthenia gravis.

*Other signs.* Weakness of the muscles of the legs and arms may be the earliest evidence of the disease, and in our experience this weakness of the legs is fairly often an early manifestation of myasthenia gravis. The hands and arms may become weak or powerless after use; such weakness was observed as an early sign in case 63. There may be complaints of weakness only in one arm, or only of the fingers. Women often complain of tiring of the arms when combing their hair. The weakness may appear to be bilaterally selective, as shown in case 33, in which the first symptom was weakness of the ring and little fingers of both hands. Weakness of the muscles of the neck is a frequent sign. On becoming fatigued the patient is unable to hold the head erect and must support it with the hands.

Other body muscles, such as those of the spine and abdomen, may be involved. In such cases the patient is unable to sit in a chair for more than a few minutes, and in the few bedridden individuals whom we have observed there have invariably been many evidences of the disease.

Muscular wasting is not commonly

present, and in severe cases, according to our experience, it is not pronounced. Whether profound myasthenia gravis may result in permanent paralysis is open to question, but Collier has maintained that this does occur. Our cases do not contain a single example of permanent and complete paralysis of muscles, unless possibly in the instances of external ophthalmoplegia. We have not observed fibrillations in the muscles of myasthenics save when there has been an overdosage with prostigmine. Wilson has described changes in the tongue: "A triple shallow longitudinal furrow is frequently found on the tongue, one running along the raphe and one on each side, midway between the former and the lateral edge."

Subjective sensory changes are described occasionally, but are probably incidental. Pain in the region of the eye led to an erroneous diagnosis of aneurysm. In case 44, pain in the eye seemed the only indication for performing drainage of the maxillary sinus. In this case there was also pain in the legs and arms. Numbness and a sensation of "pins and needles" in the arm were described in one patient.

Tendon jerks were found to be normal in the cases reported here. Tiring of the knee-jerk is said to occur in myasthenia gravis, but a brief rest results in its reappearance (Wilson).

*Course.* Myasthenia gravis is essentially a chronic disease, characterized by remissions, which usually are partial, and by exacerbations. In this series, among 63 patients, there were 9 deaths during an 11-year period. Since, however the cases were being collected during this period, these figures have no statistical value. The longest duration of the disease in a non-fatal case was 27 years, and it is noteworthy that this patient suffered at first only from weakness of the ocular muscles. The shortest course was  $3\frac{1}{2}$  months.

Respiratory infections are often asso-

ciated with exacerbations, and such cases have been observed. Pregnancy frequently has a favorable influence, and remissions commonly occur and persist for several months after delivery (Viets and others). It is of some interest that normal labor appeared to precipitate the disease in case 53. In case 54 an abortion was performed during the first trimester of pregnancy.

In fatal cases, respiratory paralysis is the usual cause of death. The injection of prostigmine is quite often a lifesaving procedure. Grinker mentioned cardiac failure as a cause of death in myasthenia gravis, and in this regard the report of Rottino and his co-workers is of interest.

*Clinical tests.* The production of fatigue by repeated voluntary efforts has already been mentioned. Closing and opening the eyes may bring on ptosis, and movement of the eyes in various directions may produce limitation of ocular movements. Counting aloud brings out a nasal quality of the voice. The patient may be unable to drink a glass of water.

Apparatus such as the dynamometer may be used to record the strength of the hand-grasp. These tests, when repeated after the injection of prostigmine, point to an increased strength of the muscles.

*Electric-response tests.* The myasthenic reaction—Jolly's reaction—is not specific for myasthenia gravis since it occurs in other conditions, such as polyneuritis, extreme debility, in some cases of epidemic encephalitis, and in cases of brain tumor (Wilson). Furthermore, absence of the myasthenic reaction is occasionally observed in undoubted cases of myasthenia gravis.

The reaction consists of progressive loss of response to rapid stimuli ("faradic" current), whether constantly or intermittently applied. Usually the apparatus employed has 60 cycles per second (60 C.P.S.). Following such loss of re-

sponse a rest period of several minutes allows the response to reappear and again follow approximately the same course. When a muscle fails to respond to such stimulation, it may respond to voluntary effort, and, conversely, when it has failed to respond to voluntary effort, it may do so to electric stimulation.

Slow stimuli ("galvanic" current) also account for progressive loss of response in the muscles stimulated, but it has been found that complete abolition of response with this type of current is not so readily obtained as with the more rapid type.

Mention has been made of electromyograms.

*Tests with drug substances.* Prostigmine methylsulfate, when injected subcutaneously in doses of from 0.5 to 1.5 mg., produces pronounced improvement in the muscle power, usually within 5 minutes, but occasionally within 20 or 30 minutes. If more than 0.5 mg. is given, 0.5 mg. atropine should be added. Ptosis is invariably improved or abolished, and other weaknesses are diminished. The muscles attached to the globe are particularly resistant to prostigmine, and increase in the range of ocular movements cannot be anticipated, although sometimes it does occur. As a result of prostigmine administration abdominal cramps, diarrhea, and loss of control of the sphincters may occur in individuals who do not suffer from myasthenia gravis. An injection of atropine is sufficient to allay these symptoms. In myasthenics large amounts of prostigmine may produce cramps and diarrhea unless sufficient amounts of atropine are given.

It is noteworthy that in all, or almost all, cases in which a diagnostic dose of prostigmine has demonstrated fatigability of the muscles, there is a general sense of well-being and increased motor power after its use.

If it is impossible to establish the diag-

nosis on the basis of the history or by the use of prostigmine, quinine may be useful. In the adult one or two doses of 0.6 gm. will almost always increase the symptoms. Such a test occasionally precipitates acute respiratory embarrassment, and in such case an injection of prostigmine gives immediate and dramatic relief.

In case 12 quinidine was given to a patient who exhibited only ocular signs of myasthenia gravis, and since he did not show any evidence of further weaknesses, the diagnosis was questioned. It would seem that since this patient suffered only from severe ocular-muscle involvement, it was impossible to detect an increase in his signs if, indeed, they were increased.

*Laboratory tests.* These have little or no value either in establishing the diagnosis or in evaluating the progress of myasthenia gravis.

According to Williams and Dyke, creatinuria is a definite symptom of myasthenia gravis. Adams and Power were unable to find any abnormality in blood chemistry. These observers found pronounced creatinuria in 6 of 28 cases, and the extent of the creatinuria did not seem to bear any relationship to the severity of the disease. In almost all their cases the feeding of glycine increased the output of creatine in the urine. Adams, Power, and Boothby also found increased creatinuria after feeding glycine. Nevin found that the phosphorus-holding compounds of muscles in myasthenia gravis were normal, and he concluded that there is no abnormality of muscle metabolism.

## TREATMENT

Prostigmine methylsulfate, from 0.5 to 1.5 mg. per hypodermic syringe, is used mainly in diagnosis, but is valuable also in emergencies, such as respiratory failure. The oral administration of prostigmine bromide is now generally accepted as the proper routine treatment. It is

available in 15-mg. tablets and is given in different amounts according to the severity of the case. It seems a good working rule to give it often in such small amounts as afford relief. In mild cases 15 mg. given three times daily may be sufficient, but in severe cases 150 to 180 mg. or more may be given in divided doses every three hours. In such cases it may be found advantageous to combine ephedrine, 0.25 gm., twice or oftener during the day. If considerable amounts of prostigmine are being used atropine is usually necessary to control abdominal cramps and diarrhea. Viets has written on this subject on the basis of a wide experience.

Mention of thymectomy has already been made. X-ray therapy applied to the thymus is said to have influenced some cases favorably.

We have not had experience in the use of synthetic adrenal cortical extract, as described by Moehlig.

#### DIFFERENTIAL DIAGNOSIS

In the cases recorded here, mention is made of several conditions which were confused with myasthenia gravis. Since, in a majority of cases, the diagnosis of myasthenia gravis demands a correct analysis of ocular signs, it would necessarily follow that conditions regularly associated with ocular signs may be mistaken for myasthenia gravis or vice versa. Ocular signs occurring as the result of abnormal thyroid states may also characterize myasthenia gravis, and the latter and hyperthyroidism may coexist. Abnormalities in associated movements of the lids which have been shown to result from misdirection of regenerated fibers in the third nerve may also be observed in myasthenia gravis when there is no change in the nerves. A mistaken diagnosis of congenital aneurysm was made in case 17. It seems that infrequently in myasthenia gravis the involvement of

muscles results in a picture almost like that seen when there is paresis of the third nerve, but in myasthenia gravis the pupillary responses remain intact. Since describing the ocular signs of intracranial aneurysm (Walsh and King), we have observed a case of aneurysm in which there was evidence of third-nerve involvement but absence of any change in the pupil. Such cases are undoubtedly rare, and consequently it seems sound to state that apparent third-nerve paralysis without pupillary change should always suggest the possibility of myasthenia gravis, whereas third-nerve paralysis associated with internal ophthalmoplegia is often due to aneurysm.

Myasthenia gravis may erroneously be diagnosed in the presence of muscular dystrophy which has involved the facial muscles, and in this regard case 63 is of interest.

An acute episode of respiratory failure as a result of myasthenia gravis may be confused with a similar occurrence in the bulbar type of poliomyelitis or encephalitis, in which instance the diagnosis can be established only by an injection of prostigmine. Such an episode in myasthenia gravis could be confused with acute hypoglycemia.

The occurrence of diplopia as an early symptom of myasthenia gravis suggests that, in differentiating it from disseminated sclerosis, confusion can arise. In some such instances the diagnosis must remain in doubt until further symptoms develop, or other features seen in disseminated sclerosis may serve to establish that diagnosis.

The ocular signs of myasthenia gravis require differentiation from those of external nuclear ophthalmoplegia and from recurrent ophthalmoplegia, which is most frequently caused by aneurysm. In these conditions there is no response to prostigmine.



In the peripheral types of myasthenia gravis confusion might arise with muscular dystrophies and atrophies. In myasthenia gravis there is an absence of wasting which distinguished the conditions mentioned, and, further, there is an absence of fibrillations of the muscle fibers which characterize muscular atrophies, and absence of the reaction of degeneration which is seen in spinal muscular atrophy.

Finally, myasthenia gravis has been described as being associated with the chronic stage of epidemic encephalitis. I have not seen such cases, but it seems probable that cases described as encephalitis with myasthenia gravis represent true myasthenia gravis.

## PART II. THE OCULAR SIGNS

*Material.* This study is based on 63 proved cases of myasthenia gravis studied in the Johns Hopkins Hospital between 1932 and 1943. Approximately 25 percent (15 of 63) of these patients first sought advice from an ophthalmologist.

Most of the examinations were reasonably complete, and included mention of the lids, ocular movements, pupils, and visual acuity. The visual fields were charted in a minority of the cases and accommodation power was accurately measured in relatively few. A majority of these patients were observed by the present writer.

*Frequency of ocular involvement.* We did not observe a single patient in whom there was no evidence of ocular involvement. In a great majority of them ocular symptoms and signs were early, but in several cases there was a history of weakness elsewhere during prolonged periods before the ocular muscles were affected.

*Purely "ocular" myasthenia gravis.* In some instances myasthenia gravis seemingly affects only the ocular muscles during lengthy periods, but such localization

does not preclude spread of the weakness, even after many years. Furthermore, in cases of "ocular" myasthenia gravis the injection of prostigmine invariably gives the patient a sense of well-being, even though the affection seems localized in the eye muscles. Cases 6 to 15, inclusive, represent what might be regarded as ocular myasthenia gravis. In one instance there was a history of onset some 13 years before the patient was examined by us. During that time there had been remissions and exacerbations which always affected the ocular muscles. Other writers have observed the affection to be restricted to the eye muscles for prolonged periods, and in this regard Gavey's patient is of particular interest, since he suffered from such an ocular affection for 25 years. One of our patients, after having suffered from recurrent diplopia and ptosis for 16 years, developed a spread of muscle weakness.

It would seem reasonable to test individuals suffering from what appears to be purely ocular myasthenia gravis with quinine. We have tested only one such individual, in whom there was no increase in signs. When the affection is generalized, the symptoms are increased.

### *Predominance of ocular involvements.*

The relative frequency and the early involvement of the ocular muscles do not require statistical confirmation. The predominance of the ocular-muscle participation in the syndrome can well be the basis of much speculation, particularly when the following considerations are taken into account. It has been shown that the extraocular muscles are finer than other voluntary muscles, and that they contain two types of fibers, one of which is thick and the other thin. These muscles contain a large amount of elastic tissue in the perimysium. Further, the complicated structure of the muscles receives an elaborate nervous supply, which is not simply

motor, from the third, fourth, and sixth nerves. There are other fibers which, according to Woollard, originate in the mesencephalic root of the fifth nerve and have a proprioceptive function. Also, as

enched by prostigmine. With these observations in mind, it would seem possible that ultimately the frequency of "ocular" myasthenia gravis may be worked out.

*Ptosis.* Ptosis of the lids of one or both

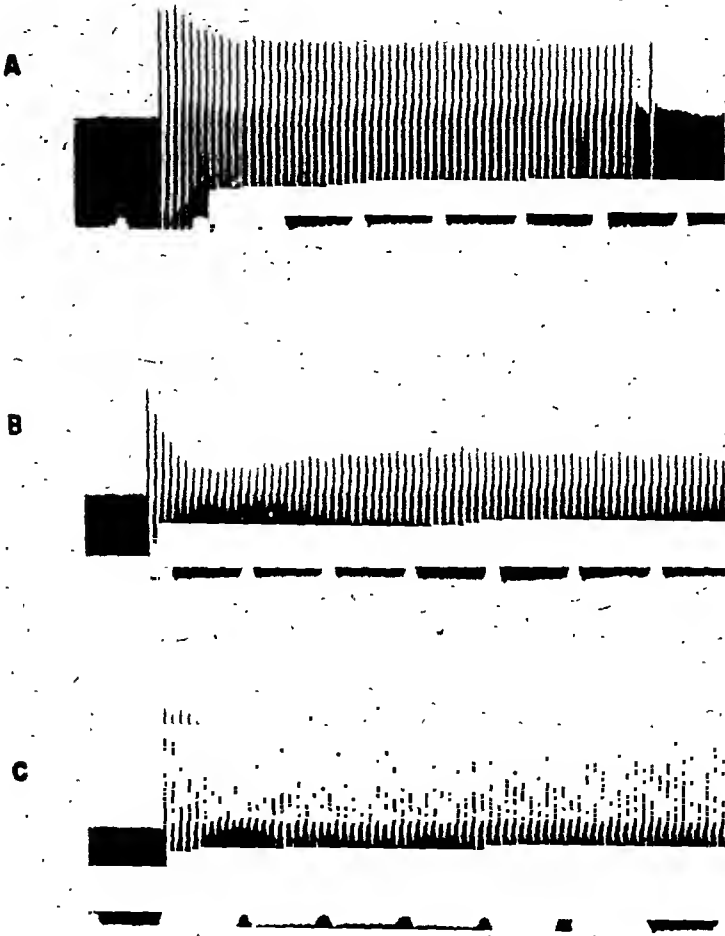


Fig. 5 (Walsh). Muscle action potentials during repetitive stimulation of the ulnar nerve in a patient with myasthenia gravis. (A) Initial tetanus after rest. (B) Second tetanus 10 seconds after the first. (C) Same as (B) 30 minutes after use of prostigmine. All nerve stimuli supramaximal. Time, 0.2 seconds. Initial potential, 6.0 millivolts (Harvey and Masland).

mentioned under the head of etiology, acetylcholine has a selective action in producing a slow tonic contraction of the normal extrinsic muscles of the eye (Duke-Elder). For some reason, in many cases paralysis of muscles attached to the eyeball are slightly, if at all, influ-

eyes is almost always present at some time during the course of myasthenia gravis. There is rarely retraction of the lids, but in one instance we have observed retraction which was preceded by ptosis. When our patients were examined bilateral ptosis was present in 34 instances,

and unilateral ptosis, in 20. In two cases it was mentioned as being absent, and in seven cases it was not mentioned. Characteristically, ptosis is most pronounced after the patient has become tired, and consequently it may be absent or minimal in the mornings. In severe cases the lids may be opened widely only once or twice after the patient awakes from sleep. Ptosis on one side may be

When more than one ampule is injected, there should routinely be included 0.5 mg. (1/100 gr.) atropine. If the ptosis has been more pronounced on one side, the lid on that side may be elevated less than its fellow of the opposite side (fig. 7). In many cases ptosis is relieved by prostigmine when the muscular palsies are affected scarcely, if at all.

*Edema of the lids.* This symptom has



Fig. 6 (Walsh). Before and after injection of prostigmine (case 2).

associated with pronounced weakness of the orbicularis oculi, and with other facial weaknesses, and in such cases the eyelids cannot be opened widely or closed tightly. This combination of weakness both in opening and in closing the eyes was observed frequently in the cases here described, and it has seemed that there is always some weakness of lid-closure when ptosis is present. Ptosis is frequently associated with limitation of extra-ocular movements in one or both eyes. Myasthenia gravis may, of course, occur in an individual with congenital ptosis. Curtis and Sitler described such a case.

It has been our experience that the injection of prostigmine methylsulfate, in amounts of from 1 to 3 c.c. of a 1:2,000 solution (ampules containing 0.5 to 1.5 mg. prostigmine) invariably produces improvement or disappearance of the ptosis and occasionally results in retraction of the upper lid (case 2, fig. 6).

been observed by Klar, who considers local edema and generalized urticaria as prodromal symptoms in myasthenia gravis. We have observed edema of the lids as the earliest involvement in case 5, in which the ptosis remained when the edema disappeared. In case 45 there was a widespread maculopapular rash at the onset of the affection, and recurrence of the rash with exacerbation. The significance of these symptoms is not at all clear.

*Retraction of the lids.* Retraction of the upper lids is observed infrequently in individuals who suffer from myasthenia gravis. In this series it was unilaterally present in two cases. In both instances retraction was associated with lid-lag. In case 11 retraction appeared and persisted after ptosis had previously chronically been present. Such a transformation from ptosis to retraction has been described by Collier. Buzzard observed bi-

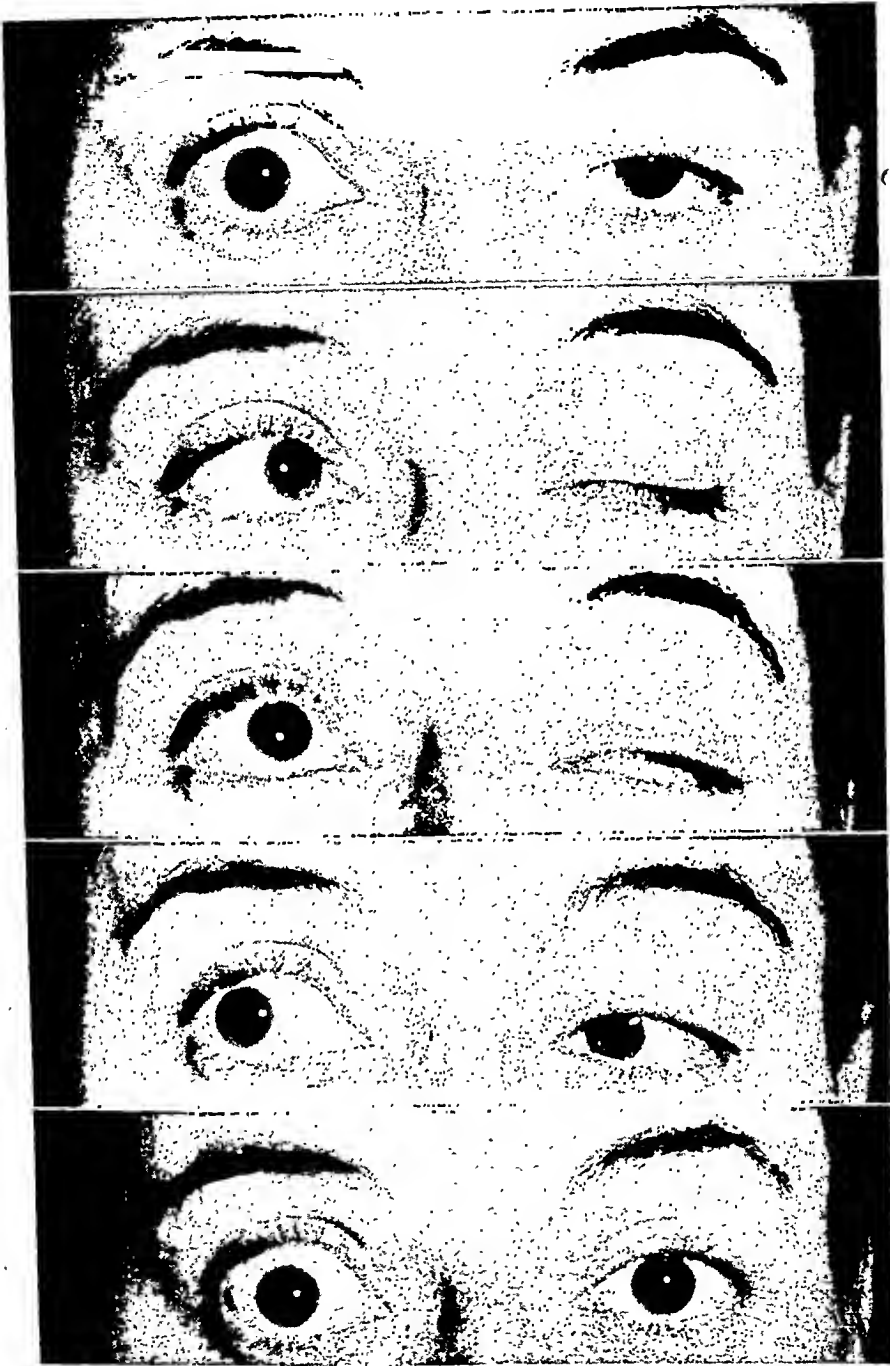


Fig. 7 (Walsh). M. J. F. (case 11). Note the staring appearance of right eye. There was "lid-lag" when the patient looked down. There is drooping of the left upper lid when the eye is abducted and slight elevation of the left lower lid when that eye is abducted. The lowest figure shows the appearance after a diagnostic injection of prostigmine.

lateral retraction of the upper lids as a transitory phenomenon in a patient who suffered from myasthenia gravis. There was retraction, which lasted for only a few

minutes when the patient awakened, and then ptosis appeared and persisted. These observers regarded the retraction as evidence that the plain muscle fibers of the

lids are not involved in the myasthenic process.

The combination of ptosis in one eyelid and retraction of its fellow of the opposite side results in an unusual picture (fig. 7). The fact that retraction developed after there had previously been ptosis points to the abnormality being peripheral in myasthenia gravis.

An explanation for retraction of one or of both lids in myasthenia gravis is not readily available, but the phenomenon does stimulate speculation. It is interesting to compare figure 7 with figure 6. It may be observed that in case 2 the injection of prostigmine was responsible for the retraction of a previously ptosed lid; that is, it produced the same condition that was chronically present in the right eye in case 11. If it is acceptable that acetylcholine is the transmitter substance responsible for the contraction of skeletal muscle, and if it is further acceptable that the threshold of the muscle for this substance may be lowered, it would seem to follow that in case 11 the elevator muscle of the right upper lid had become exquisitely sensitive to acetylcholine. The lid-lag in case 11 and case 48 suggests activity of the plain muscle in the lids.

In unilateral cases, such as case 11, another explanation might be offered. If an extraocular muscle is paretic and the eyes are turned toward the field of action of that muscle, there is a secondary deviation of the sound eye. The retraction of the upper lid of the right eye in case 11 might represent a state of secondary deviation. However, if this were a true explanation of the anomaly, unilateral retraction of the lid would commonly be seen in myasthenia gravis. Further, bilateral retraction does occur.

Actually, retraction of one or both upper lids occurs under a variety of circumstances in which explanation is dif-

ficult. It may be observed in hyperthyroidism, and mention is made further on regarding the possible relationship between ocular signs in hyperthyroidism and in myasthenia gravis. It also is seen in association with lesions of the brain stem and posterior commissure (Collier), and it occasionally occurs as a transitory phenomenon in persons whose health seems excellent. A congenital variety has been described.

*Abnormal associated movements of the upper eyelid.* In two cases an interesting anomaly was observed in an associated movement of the upper eyelid. In case 11 (fig. 7), previously mentioned in association with retraction of the upper lid of the right eye, there was abnormal lowering of the upper lid of the left eye when that eye was carried into the abducted position. In case 44 (fig. 8), when the eyes were carried into the field of the paretic left external rectus muscle, there was anomalous elevation of the right upper lid.

Both phenomena are precisely similar to what has been described regarding the upper lid in cases of regeneration of the third nerve with misdirection of fibers (Bender; Ford; and Ford; Walsh and King). In cases of misdirection of fibers there is elevation of the upper lid when the affected eye is adducted; that is, when it is moved into the field of the internal rectus muscle, which is also innervated by the third nerve. In the instance of the eye being abducted, the upper lid is abnormally lowered, presumably because the eye is taken out of the field of action of the internal rectus. This is in conformity with Sherrington's law of reciprocal innervation, which is to the effect that contraction of an ocular muscle is associated with simultaneous relaxation of its opponent muscle. However, the upper-lid phenomena observed in cases of myasthenia gravis cannot be due to misdirection of nerve

fibers, since, so far as we are aware, there is no change in the nerves in myasthenia gravis. That the law of reciprocal innervation is still in effect when myasthenia gravis is present can scarcely be doubted, and in myasthenia the muscular involvements are such that abnormal lowering of

bilateral, is frequently present in myasthenics. Wilbrand and Saenger found weakness of the orbicularis oculi in 25 of 45 individuals suffering from myasthenia gravis (Taylor, in Posey and Spiller). In our series, 16 cases showed bilateral facial weakness, and in all of



Fig. 8 (Walsh). Paresis of the left external rectus muscle and ptosis of the left upper lid. Note the abnormal widening of the palpebral fissure on the right when the eyes are directed to the left. The right eyebrow is considerably lower than the left.

the upper lid when the eye is in abduction is an anticipated result. The retraction of the upper lid in case 44 probably is dependent upon changed threshold of the ocular muscles for transmitter substance.

*Weakness of the orbicularis oculi and facial muscles.* It has previously been stated that facial weakness, almost always

these the orbicularis oculi was weak. As a result of this weakness, there is an inability to close the eyelids tightly. In only two cases was there apparent to the examiner only weakness of both orbicularis muscles. Ptosis in myasthenia gravis is often associated with weakness in closure of the eyelids, which is mani-

fest if looked for. Undoubtedly, in all cases in which there is ptosis there is also some degree of weakness of the orbicularis, a symptom that can be elicited by repeated efforts at tightly closing the

currence of Bell's phenomenon (upturning of the eyes on efforts to close the eyelids against resistance). This was observed in two cases in which the facial weakness was that of myasthenia gravis. The reaction of degeneration (R.D.) is quite different from the myasthenic reaction.

*Limitation of ocular movements.* Limitation of movement of the eyes due to weakness of the extraocular muscles varies within wide limits. In mild cases there may be occasional diplopia when examination does not reveal limitation in range of movements of either eye. In such cases there is danger of the condition being considered "functional." The muscle-balance tests vary from time to time.

In other cases characterized by minimal ocular involvement there is diplopia, which appears regularly in association with slight degrees of ptosis. Occasionally there may be limitation of movement, restricted to the field of a single muscle. Minimal involvements of the extraocular muscles may persist for long periods. When cases of this nature are encountered, repeated efforts to move the eyes into various positions usually bring out a manifest limitation in the range of movements in one or more fields.

It has often been stated that inability to move the eyes upward is seen most often, that limitation or loss of convergence is next in frequency, and defect in downward movement is the least common defect in myasthenia gravis. This study neither supports nor refutes this generalization. It does show that limitation of movement of the eyes may be unilateral or bilateral and in any direction, and that sometimes there is a close resemblance to supranuclear paralysis of conjugate movement.

In quite a number of cases in this series there was pronounced limitation of the

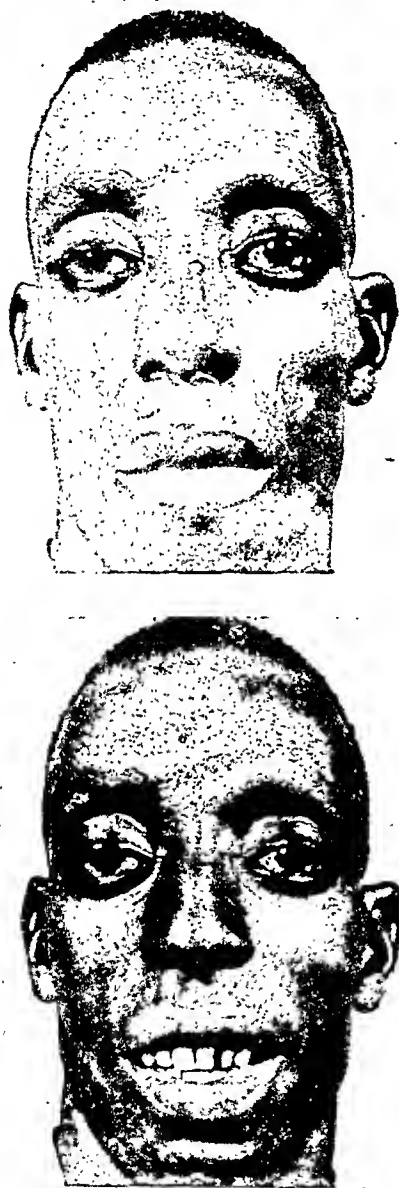


Fig. 9 (Walsh). Exposure keratitis in Negro suffering from myasthenia gravis (case 32).

eyelids. In one instance (case 32, fig. 9) we observed exposure keratitis.

In bilateral or unilateral incomplete facial-nerve paralysis efforts to close the eyelids almost invariably result in the oc-

extraocular movements, and in such cases there invariably was severe bilateral ptosis. These cases of myasthenic ophthalmoplegia are of particular interest for two reasons: First, the extraocular palsies exhibit a pronounced and characteristic resistance to improvement when prostigmine is used as a diagnostic or therapeutic agent. In our cases the ptosis invariably was lessened or abolished by the administration of a diagnostic injection of prostigmine. The paresis of the extraocular muscles invariably was improved slightly, if at all. Secondly, there is the possibility that in such cases of almost complete external ophthalmoplegia there may be a permanent structural change in the muscles which amounts to persistent and total paralysis.

As regards myasthenia gravis and involvement of ocular muscles of only one eye, the series contains several cases of interest. Such cases have been reported by Moore.

Cases of myasthenia gravis in which there appears to be paralysis of conjugate movements of the eyes are unusual, but we have observed two such cases.

*Pupillary changes.* It has often been stated that in myasthenia gravis the pupillary response to light may become sluggish (Wilson, Brain, Rea, among others). This has not been our experience. Furthermore, it would seem that there would be a tendency toward pupillary dilatation in individuals with severe myasthenia if the pupillary reaction tended to tire—and there is no such tendency so far as the author is aware.

*Changes in accommodation.* Rabinovitch and his co-workers demonstrated a rapid reduction in accommodation power by recession of the near point from 7 to 40 cm. in the right eye, and from 12 to 40 cm. in the left eye; according to retinoscopic examination, their patient exhibited a spasm of accommodation when

the test was begun. The cases which have been used in this study cannot be considered as contributing to our knowledge regarding accommodation in myasthenia gravis.

*The visual fields and visual acuity.* There was no instance among the cases here reported of any change in visual acuity or in the visual fields.

*Ocular signs common to thyroid states and myasthenia gravis.* The ocular signs associated with thyroid states are generally well known. The same signs may be present in myasthenia gravis. Such signs, as exemplified in the writer's case reports, are: progressive exophthalmos, retraction of the upper lid with delay in down-following movement (lid-lag), difficult or absent convergence, and muscle palsies, which are particularly likely to be pronounced in so-called exophthalmic ophthalmoplegia.

Examination of the muscles in exophthalmic ophthalmoplegia and in some instances in myasthenia gravis may reveal the presence of lymphoid cells in both.

As regards the response of the paretic ocular muscles in exophthalmic ophthalmoplegia to prostigmine, this study is not pertinent. In myasthenia gravis associated with paralysis of the extraocular muscles the injection of prostigmine rarely does more than improve or abolish the ptosis, and in exophthalmic ophthalmoplegia ptosis usually is not present.

#### SUMMARY OF OCULAR SIGNS

This study has nothing to add to what has already been written regarding the ocular signs of myasthenia gravis.

However, the following observations were made: (1) Ocular symptoms and/or signs were present in all cases. (2) Purely "ocular" myasthenia gravis was observed several times, but in such cases there is always the possibility of spread of the weaknesses. (3) The ocular symptoms



and signs usually appear early in the course of the disease, but occasionally they are a late development. (4) Ptosis is the most constant ocular sign. (5) Edema of the lids is a rare prodromal sign. (6) Retraction of the lids is a rare ocular sign which was observed in one case after a chronic ptosis. (7) The similarity of abnormal associated movements of the lids in myasthenia gravis, and as a result of misdirection of regenerated fibers in the third nerve, was noted. An explanation for these lid phenomena in myasthenia gravis was not attempted. (8) Weakness of the orbicularis oculi may occur in the absence of ptosis or with it. Probably

weakness in closure of the lids is overlooked more often than any other common ocular sign. (9) Limitation of ocular movements occurs unilaterally or bilaterally and in almost all combinations. (10) When pupillary abnormalities are present, it is doubtful if the case is one of myasthenia gravis. (11) Changes in accommodation were observed in only one case. (12) The visual fields and visual acuity are not altered. (13) The similarity of the ocular signs seen in myasthenia gravis and in thyroid states is noteworthy.\*

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## THE STANDARDIZATION OF SO-CALLED SCHIÖTZ TONOMETERS\*

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The word "so-called" has been added to the title to express the well-known fact that many of the Schiötz tonometers in use in the United States do not meet the physical specifications set up for such tonometers by Schiötz himself, not to mention the more rigid specifications set up by more recent workers in this field. Differences between the standard tonometer which Schiötz used in his calibration work and the tonometers used in the practice of ophthalmology may be the result of inaccurate, careless construction as well as of wear and tear. While a certain amount of the latter was unavoidable (because of the nature of the metals used), differences in construction could have been eliminated if all manufacturers had been induced to turn out only accurate replicas of the original instrument. No official action of that sort was taken, and the manufacture of Schiötz tonometers was taken up by a number of small firms and independent instrument makers who copied an original Schiötz instrument to the best of their ability and understanding. The situation was made worse by the fact that in some respects instruments manufactured and certified under the supervision of Schiötz and his technical assistant A. Tandberg did not comply with their own specifications. Among the 27 original Schiötz tonometers which I have examined and tested there has not been a single one whose plunger assembly (that is plunger plus lowest weight plus hammer and pointer) exerted the specified weight of

5.5 grams. In the majority of these tonometers the plunger assembly weighed between 6 and 6.2 grams; that is, about 11 percent more than specified. Posner and Schoenberg<sup>1</sup> have obtained similar findings. The resulting error amounts to about 3 mm. of intraocular pressure within the range of 20 to 30 mm.

The inaccuracy of the German reproductions of the Schiötz tonometer and its effect upon practical tonometry became very apparent after World War I. The need was felt of methods to determine (1) how much a given instrument deviated in its physical properties from those of a Norwegian standard instrument and (2) what the effect of such deviations was upon the tonometric reading with a representative group of human eyes. To subject a given tonometer to such methods means standardization. Personally I feel that standardization should, if possible, include measures to correct deviations found under (1), so that on a representative group of eyes, the particular instrument will give readings closely approximating those of a standard tonometer. It should be remembered that standardization and calibration are two different things. The latter term implies the conversion of tonometric readings into units of intraocular pressure, whereas the former comprises measures that will assure a uniformity of the tonometric reading with different tonometers.

During the last 20 years the problem of standardization has received a great deal of attention. Much talent, ingenuity, and plain "elbow grease" have been applied to it. The net result is that there still is no simple, generally accepted meth-

\* From the Illinois Eye and Ear Infirmary, The University of Illinois. Read before the Chicago Ophthalmological Society on March 20, 1944.

od of standardization (Sachs and MacCracken<sup>2</sup>). In principle two methods are in use:

1. The physical properties of the tonometer in question are measured with suitable gauges, calipers, and scales and compared with those of a standard tonometer.

2. The performance of the tonometer in question is compared with that of a standard instrument on the eye or eyes of animals, or on a cornealike membrane which is part of an "artificial eye."

It might be well to review briefly the principles of tonometry with an instrument of the Schiötz type. During the application of the instrument two independent weights rest upon the eye. There is the foot plate plus cylinder, frame, and graduated arc which weigh roughly 11 grams and rest upon a fairly large portion of the cornea. The curvature of the footplate is very much less than that of the cornea. The natural effect of the application of the foot-plate assembly is an "applanation" of an area of the cornea the size of which depends upon the intraocular pressure. The lower the intraocular pressure the greater is the flattened-out area of cornea. The change in shape and curvature of the cornea brought about by the foot-plate assembly is called the *deformation* or *distortion*. The second weight is incorporated in the plunger assembly, that is the plunger plus weights, hammer, and pointer. This is the weight that should be 5.5, 7.5 or 10 grams, respectively. To this weight pointer and hammer contribute an amount of about 2.2 grams, varying slightly with the position of the pointer. The plunger assembly indents the central portion of the cornea. This change in shape and cornea is called the *indentation*. It is the depth of that indentation beyond the level of the deformation which the tonometer measures and records 20 times magnified as the so-

called *tonometric* reading or *swing*. In the light of this analysis the essential physical properties of the tonometer would be: (1) size and curvature of the foot plate, since they determine the shape of the deformation; (2) the weight of the foot plate assembly, since it determines the size of the deformed flattened bulbus area; (3) diameter and curvature of the end of the plunger, since they determine the shape of the indentation; (4) the weight of the plunger assembly, since it determines the depth of the indentation; (5) the lever ratio and general construction of the magnifying and recording device.

Now let us turn to the ocular factors which determine the tonometric reading. Obviously, the main factor opposing indentation and deformation is the intraocular pressure. The experimental work of Schiötz and Priestley Smith revealed considerable and consistent variations of the tonometric reading on eyes whose intraocular pressure had been brought to exactly the same level. Logically, Schiötz thought that differences in ocular size and in thickness and elasticity of the eyeball wall account for these variations. Friedenwald's brilliant mathematical analysis of tonometry<sup>3</sup> has taught us to distinguish clearly between two factors that determine the impressibility of the eye, which is what the tonometer measures. With an ingenious method based upon two successive tonometries with widely divergent weights Friedenwald showed that the tonometric reading could be broken down into its two components, the intraocular pressure and the ocular rigidity. Unfortunately, the tonometers that have been available during the last 10 years are not accurate enough to permit reproducible rigidity determinations except under very favorable conditions. In my own hands, Friedenwald's method has convinced me of the existence of consistent differences

in ocular rigidity in different eyes. I do not believe that I know the limits of physiologic variations of ocular rigidity, although they must be about as great as those suggested by Schiötz's findings in his calibration work. It is to be hoped that postwar refinements of the Schiötz tonometer will permit accurate rigidity determinations on a large scale, which, I am confident, will confirm the soundness of Friedenwald's concept. Until then I believe we shall have to assume, in the practice of ophthalmology, that the eyes whose intraocular pressure we wish to determine by tonometry possess *average* ocular rigidity, and convert tonometric readings into millimeters of intraocular pressure by using Schiötz's nomogram of 1924<sup>4</sup> with the minor corrections suggested by Friedenwald in 1937.

The concept of ocular rigidity has a very definite bearing upon the standardization of tonometers if the latter is done on single artificial, animal, or human eyes. If this eye possesses average ocular rigidity, it is probable that two tonometers which check well on this eye (or device) will also check well under ordinary clinical conditions. If the eye or device used for standardization does not possess average rigidity it is not certain at all that a match between two tonometers under laboratory conditions will remain a match in clinical practice. Eyes with average rigidity usually give identical or parallel calibration curves. Eyes with low or high rigidity often give calibration curves that are not parallel to those of eyes with average rigidity. For that reason I believe it is necessary that standardizations done on animal or human eyes are made either on eyes proved to possess average rigidity or on large enough groups of eyes to make it probable that all variations of ocular rigidity are duly represented.

Standardization of tonometers by comparing the performance of unknown

with that of a standard instrument on a representative specimen or group of animal or human eyes is cumbersome and difficult. It would be very time-consuming to carry out a large number of such standardizations.

The Committee on Standardization of Tonometers of the American Academy of Ophthalmology and Otolaryngology has adopted the other method of standardization; that is, the measurement of all important physical properties of the instrument. The details of the method have been worked out by Posner.<sup>5</sup> The main steps of the procedure concern: (1) size and curvature of the foot plate; (2) diameter and curvature of the end of the plunger.

If these measurements prove to be within the limits of tolerance approved by the Committee, the examiner proceeds to weigh: (3) the foot plate assembly and (4) the plunger assembly.

In these measurements determinations of the friction between cylinder and handle and the friction affecting upward movement of the plunger are included. The latter consists of the friction between plunger and cylinder, between plunger tip and the undersurface of the hammer, and at the fulcrum.

Finally, the magnifying and recording device is checked; a micrometer gauge providing indentations of varying depth is used for this purpose.

The deviations from the standard encountered most commonly are faulty weights of either the foot plate or the plunger assembly or inaccuracies of the magnifying and recording device, the lever ratio being greater or smaller than 1:20 or being discontinuous.<sup>1</sup> The effect of all these deviations upon the tonometric reading can be figured out mathematically following principally Friedenwald's theory of tonometry, and the respective correction factors can be determined.

Thus it is possible, if the curvature and size of the foot plate and plunger end are within tolerable limits, to correct the existing deviations by providing a new calibration curve for the particular instrument. Such calibration curves have, in some instances, been very irregular and discontinuous. The computation of these curves has occasionally been so complicated that I have had doubts as to the reliability of the final result.

For that reason I started about 18 months ago to subject nine of these "corrected" tonometers to a rigid checking on a representative group of human eyes. Patients from my private practice as well as from the Illinois Eye and Ear Infirmary volunteered for this purpose after they were told that I would like to check their intraocular pressure with two dif-

ferent instruments. Patients with known or rather consistent ocular rigidity were selected for this purpose. The range of intraocular pressures covered was from 15 to 45 mm. of mercury. Each tonometer was compared with a standard on at least 20 different human eyes. While this again was a time-consuming process it was very gratifying to see that tonometers corrected by the foregoing method showed no significant differences in the tonometric measurements in more than 1 out of 10 checks of human eyes. Thus I proved at least to my own satisfaction that our method of correcting tonometers made them perform in close agreement with the standard. The method of standardizing tonometers by measuring the physical properties is therefore practically sound.

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## THE LENS IN ACCOMMODATION\*

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The mechanism of accommodation has intrigued students of the eye, and a number of theories of its action have been proposed. Acceptable theories have in common the requirement of an elastic lens and an equatorial ligament pulling almost radially with sufficient force to change the form of the lens and give the eye a change of refracting power from 70.6 to 56.6 diopters. Fincham's observations placed the compressive force in the capsule and noted that the lens substance seemed to bulge through an opening as though it were pressing outward on the capsule at all points.

One difficulty with the theory of accommodation by relaxation has been the force required to change the lens form by elastic compression. Adler points out that the theoretical tension on the choroid at rest would destroy it. The ciliary muscle is small, particularly the long fibers which tense the choroid in relaxing the lens ligament. The lens is made of a very firm center whose rods are axially directed and not easily deformed even by finger pressure. And yet it is obvious to the touch that the axial diameter as a whole can be easily reduced. The interior of the lens, therefore, was investigated to find any feature that would permit a small force to accomplish large changes in form.

The lens develops from an ectodermal vesicle whose medial wall grows into long parallel lens rods, whereas the lateral wall remains a cellular lens membrane. Additions of cells to the nucleus at its margins are made from this membrane, so that from the beginning the lens form grows flatter and its focal length increases. Long before birth the lenticular portion of the

central retinal artery is obliterated, and the rods at or near the axis receive less nutriment and oxygen. As they fail to elongate, peripheral rods curve over them both medially and laterally from the equator toward the axis. Up to the time of birth this spheroidal lens is a continuum from the protoplasmic outer rods, with a refractive index of 1.33 to the non-living dense protein mass of the center, where, in the adult, rod structure is not easily demonstrated. The refractive index of this center rises to 1.46. After birth, as the lens grows and at the same time functions increasingly in accommodation, stresses are set up tangential to the surface, and the rods become aligned in sheets. Between the sheets is albuminous liquid. One stress zone in particular contains more liquid than the rest and separates the nucleus from the surrounding cortex. The cortical lamination is equivalent to the menisci pictured by Cowan with diagrammatic simplicity.

The mature crystalline lens in tension and in relaxation is pictured in figure 1. It is seen that tension at the equator, besides slightly stretching the lens, moves liquid along the stress zone to the equator whereas in relaxation liquid moves back to the axis on both sides of the nucleus. The nucleus is held in position by strands that cross the liquid-filled zone, but the whole nucleus is moved forward. The force in this axial expansion is furnished partly through cortical elasticity and partly through hydrostatic pressure probably based on a small differential in osmotic pressure of lenticular fluid over surrounding fluids. The hydrostatic component operates uniformly in all directions, but its effectiveness on any wall varies directly with the radius of curvature of that wall

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and the thickness of the wall. The curved prismatic cortical lens rods in turgor tend to become straight and in doing so supply the necessary elastic component. These

literated and the whole lens becomes, like the nucleus, an unyielding and highly refractive mass. Beef eyes are generally from young animals. The lens is double

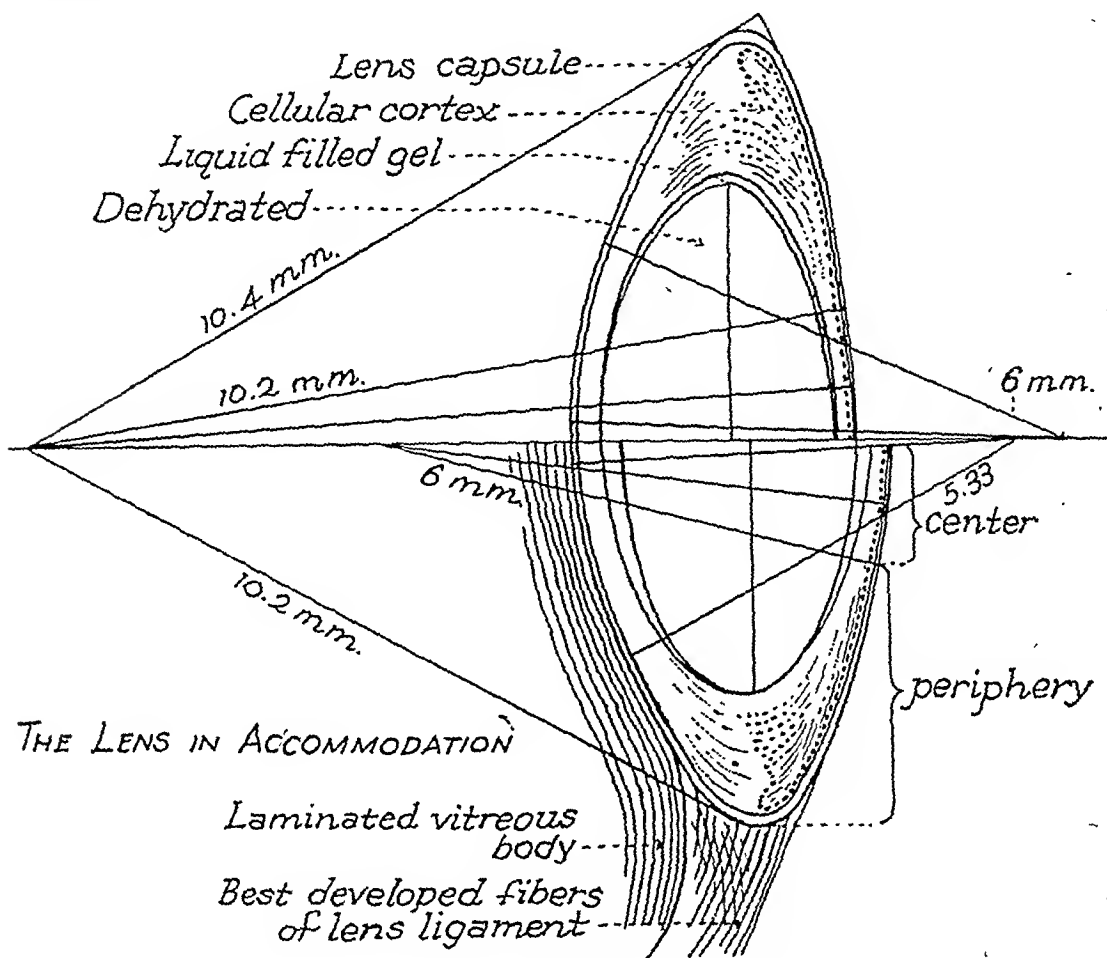


Fig. 1 (Sinclair). The mature crystalline lens in tension and in relaxation.

forces, taken together with the fact that the central or pupillary zone of the cortex is thin, permit the change in radius of curvature characteristic of accommodation in this region. This change does not extend to the whole lateral lens face.

The lenticular structure here pictured is found in the human eye after birth. In old age the liquid space is reduced or ob-

the diameter of the human lens, and the structure of the liquid stress zone is easily demonstrated.

The theory of lens elasticity presented here does not call for modification of accepted theories of accommodation but it does make more plausible the effectiveness of the force of tension in the lens ligament.

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# EXTRACTION OF SENILE CATARACT\*

## A STATISTICAL COMPARISON OF VARIOUS TECHNIQUES AND THE IMPORTANCE OF PREOPERATIVE SURVEY

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When the Wilmer Institute was opened, in 1925, the technique used for the extraction of senile cataract was a combined extracapsular extraction without conjunctival flap or sutures. This original technique has been modified gradually but radically during the past 19 years by the following successive changes: the use of a conjunctival or "pocket" flap closed with sutures; intracapsular extraction by the tumbling method with forceps; the use of one or two corneoscleral sutures; and, finally, the preservation of a round pupil. The material for this study consists of all the operations for uncomplicated senile cataract either by the resident house staff or the full-time staff of the Institute between 1925 and October, 1943, a total of 2,086 extractions. It is the object of this paper (1) to compare the results obtained by the different methods used during this period, and (2) to determine the factors which obviate complications and produce the best end results. In later papers, various details and corollaries uncovered in this survey will be discussed. In this study, no factor will be considered to have any statistical significance unless the probability of error is less than 1 in 20.

\* From the Wilmer Ophthalmological Institute of The Johns Hopkins University and Hospital, Baltimore.

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### RESULTS OF VARIOUS TECHNIQUES

When the gradually shifting technique is viewed in retrospect, five distinct methods of extraction become apparent; namely, (A) capsulotomy followed by extracapsular extraction, with a full iridectomy, and without the use of conjunctival flap or sutures; (B) combined extracapsular extraction using a conjunctival flap closed with sutures; (C) combined intracapsular extraction with conjunctival sutures; (D) combined intracapsular extraction with one or two McLean-type silk corneoscleral sutures;<sup>1</sup> and (E) round-pupil intracapsular extractions, usually with two corneoscleral sutures and one peripheral iridotomy. These five groups are of unselected cases, but do not include 436 operations with other combinations of technique; for example, keratome incision followed by capsulotomy and lavage, extracapsular extraction with corneoscleral suture or round pupil, or unsuccessful intracapsular attempts with rupture of the capsule.

The incidence of complications which followed each of the five techniques is given in table 1a. Loss of vitreous occurred most frequently in combined intracapsular extractions, and least often in round-pupil intracapsular extractions. Incomplete closure of the corneal wound at the end of the seventh postoperative day and prolapse of the iris were greatly reduced by the use of one and especially of two corneoscleral sutures. Anterior-chamber hemorrhages occurred most frequently after combined intracapsular

extractions with conjunctival sutures and least frequently after round-pupil intracapsular extractions with two corneoscleral sutures. The incidence of post-operative iridocyclitis decreased markedly with total extraction of the lens. Sec-

*Table 1b.* Over one third of the extracapsular extractions later had to be followed by at least one dissection to obtain satisfactory vision. In some cases, it was also necessary to reopen the eye with a keratome to perform a capsulectomy or

TABLE 1a  
COMPLICATIONS FOLLOWING VARIOUS TECHNIQUES OF CATARACT EXTRACTION

Technique	No. of Cases	Loss of Vitreous percent	Incomplete Closure of Wound percent	Pro-lapse of Iris percent	Anterior-Chamber Hemorrhage percent	Iridocyclitis percent	Secondary Glaucoma percent	Detachment of Retina percent
A. Extracapsular Full iridectomy Without sutures	373	6.7	5.1	4.3	8.0	15.5	5.3	1.3
B. Extracapsular Full iridectomy Conjunctival sutures	266	5.6	4.1	4.1	9.8	9.4	7.5	1.9
C. Combined intracapsular Conjunctival sutures	207	14.5	4.3	6.8	15.0	5.8	5.8	3.4
D. Combined intracapsular Corneoscleral sutures	424	12.7	1.9	1.7	10.8	2.8	2.4	1.3
E. Round pupil Intracapsular Corneoscleral sutures	380	2.7	0.3	1.3	4.5	1.4	1.6	0.5

TABLE 1b  
RESULTS OF VARIOUS TECHNIQUES OF CATARACT EXTRACTION

Technique	No. of Cases	Dis-section percent	Capsul-ectomy or Lavage percent	Residual Capsular Remains percent	Astigmatism 5D. and Over percent	Visual Results percent				
						No. of Cases **	20/15 to 20/30	20/40 to 20/70	20/100 to 20/200	Less than 20/200
A. Extracapsular Full iridectomy Without sutures	373	38.1	7.0	18.2	16.2	257	65.4	15.6	4.3	14.9
B. Extracapsular Full iridectomy Conjunctival sutures	266	34.2	4.2	13.9	15.9	193	76.2	12.4	4.2	7.4
C. Combined intracapsular Conjunctival sutures	207	3.4	1.0	1.0*	8.1	142	79.0	6.3	4.2	10.5
D. Combined intracapsular Corneoscleral sutures	424	0.5	0.7	0.2*	1.2	301	85.7	8.6	2.0	3.3
E. Round pupil Intracapsular Corneoscleral sutures	380	0.8	0	0.5*	0.6	268	91.7	4.5	1.2	1.9

\* Pupillary space occluded by organized material or iris drawn up by anterior synechiae.

\*\* Excluding those without adequate refraction or with extraneous causes of poor vision; for example, senile macular degeneration.

ondary glaucoma became less frequent following intracapsular extractions with corneoscleral sutures. Detachment of the retina was somewhat higher in the early intracapsular extractions with conjunctival sutures.

lavage of cortical remains. In spite of these measures to clear the pupillary space, 16 percent of those having had extracapsular extractions obtained a final vision of less than 20/30 solely because of residual capsular remains or the de-

velopment of Elschnig bodies. Many of these patients refused to have secondary operations performed. In a few instances after intracapsular extractions, it was necessary to perform a secondary operation to open a pupil occluded by organized exudate or drawn up by anterior synechiae. The percentage of eyes having a final astigmatism of 5 diopters or more became progressively less with the use of sutures to close the corneal wound more securely.

Tabulation of the final visual results includes only those patients who had an adequate refraction and had no causes of poor vision independent of the cataract extraction; for example, senile macular degeneration or other pathologic condition. In addition, those patients with a final vision of less than 20/30 because of residual capsular remains were excluded unless an attempt had been made to open the pupillary space by a discission or capsulotomy. The average postoperative follow-up of groups A to E varied, respectively, from 23 months to 6 months, the average for all groups being 14 months. Table 1b shows that the percentage of patients who obtained good vision progressively rose with each change in technique, and, with the exception of group C, the incidence of poor visual results diminished. The gradual improvement in final visual results of each successive method was also manifest in the tabulation of all cases, including those cases excluded from table 1b ("Visual results").

*In summary*, with each change in technique during the past 19 years, the incidence of postoperative complications has become lower and the final visual results have become better except for the early technique of combined intracapsular extraction with conjunctival sutures used between 1930 and 1937, which was associated with a higher incidence of certain

complications such as loss of vitreous, prolapse of iris, anterior-chamber hemorrhage, and detachment of the retina. The question therefore arises; what are the individual factors in operative technique that have a significant influence on postoperative complications and the final result?

# FACTORS IN OPERATIVE TECHNIQUE INFLUENCING POSTOPERATIVE COURSE

*1. Residual lens cortex and capsule after nontotal or extracapsular extraction.* In this study, a patient was considered to have postoperative iridocyclitis if the eye remained congested externally and the aqueous ray persisted for

TABLE 2  
INFLUENCE OF RESIDUAL CAPSULE AND CORTEX ON THE DEVELOPMENT OF POSTOPERATIVE IRIDOCYCLITIS

Technique	No. of Cases	Iridocyclitis percent
Extracapsular with cortical remains	169	31.4
Extracapsular without cortical remains	854	8.4
Intracapsular	1046	2.8

over three weeks after operation, if non-specific protein-fever therapy was instituted, or if signs of iridocyclitis developed later (for example, inflammatory changes in the iris, positive aqueous ray, and K.P. deposits on the posterior surface of the cornea). Iridocyclitis was found to be more common after extracapsular than after intracapsular extractions (table 2). Almost one third of the patients with retained lens cortex developed postoperative iridocyclitis. In respect to this complication: Is an unsuccessful attempt at intracapsular extraction (that is, an unintentional rupture of the capsule during delivery) less desirable than an intentional extracapsular extraction with capsulotomy? Analysis of

the figures shows that the incidence of retained cortex and postoperative iridocyclitis was essentially the same in both groups (table 3). Also, accidental rupture of the capsule was not accompanied by any increase in the frequency of vitreous loss compared to successful intracapsular extractions.

Attempted intracapsular extractions have been considered unsuccessful if the capsule ruptured either in the eye or when emerging through the wound. Prior to 1939, 37 percent of capsules were ruptured during delivery. Between 1939 and 1943, 19 percent of capsules were ruptured. The tumbling method with the Kalt forceps was used in the early years and later the Arruga or Castroviejo forceps was substituted. Occasionally the Barraquer suction cup was used for hypermature lenses. The incidence of broken capsules was highest for mature and

TABLE 3

COMPARISON OF UNSUCCESSFUL INTRACAPSULAR (BROKEN CAPSULE) VS. INTENTIONAL EXTRACAPSULAR EXTRACTIONS

Technique	No. of Cases	Cortical Remains percent	Iridocyclitis percent
Unsuccessful attempt at intracapsular (broken capsule)	338	16.3	10.9
Intentional extracapsular (with capsulotomy)	668	16.6	13.0

hypermature lenses, and in patients under 50 or over 80 years of age. Assistant residents were as successful in extracting the lenses in capsule as were operators of more experience. The junior men, however, operated chiefly on eyes in selected cases.

2. *Loss of vitreous.* Loss of vitreous has been classified into three groups: "presentation" of vitreous refers to a re-formed anterior chamber following extraction of the lens without external loss

of vitreous; moderate loss refers to a visible loss of formed or semiformed vitreous; and severe loss indicates the loss of a large amount of formed vitreous usually with softening of the globe. Loss of vitreous predisposed to the develop-

TABLE 4

RELATION OF VITREOUS LOSS TO THE DEVELOPMENT OF POSTOPERATIVE COMPLICATIONS (ALL CASES)

Loss of Vitreous	No. of Cases	Persistent Vitreous Opacities percent	Retinal Detachment percent
None	1720	6.6	0.9
Presentation	154	16.2	1.3
Moderate	141	19.6	5.7
Severe	46	37.2	10.9

TABLE 4a

RELATION OF VITREOUS LOSS TO POSTOPERATIVE COMPLICATIONS (INTRACAPSULAR ONLY)

Loss of Vitreous	No. of Cases	Postoperative Iridocyclitis percent
None	861	1.2
Presentation	79	12.7
Moderate or severe loss	96	8.3

ment of persistent vitreous opacities and simple detachment of the retina (table 4). In addition, loss of vitreous increased the frequency of iridocyclitis after intracapsular extractions, in which group of cases the factors of capsular or cortical remains were excluded (table 4a). The persistent vitreous opacities subsequent to vitreous loss were found to originate from iridocyclitis and vitreous hemorrhage. Over one half of the round-pupil extractions complicated by presentation or loss of vitreous resulted in irregularity of the pupil, often with anterior peripheral synechiae. Uncomplicated round-pupil extractions showed some irregularity of the pupil in 10 percent of the cases.

*Relative importance of capsular or cortical remains and vitreous loss with re-*

TABLE 5  
RELATIVE IMPORTANCE OF CAPSULAR OR CORTICAL REMAINS AND VITREOUS LOSS  
ON FINAL VISUAL RESULT

Technique		No. of Cases*	Vision (percent)		
			20/15-20/30	20/40-20/200	Less Than 20/200
No loss of vitreous	Intracapsular	608	91.0	6.2	2.8
	Extracapsular	519	81.0	12.6	6.4
	Cortical remains	94	54.2	22.4	23.4
Presentation of vitreous	Intracapsular	59	76.3	15.2	8.5
	Extracapsular	41	65.8	26.9	7.3
	Cortical remains	11	72.7	18.2	9.1
Moderate loss of vitreous	Intracapsular	48	68.8	18.7	12.5
	Extracapsular	32	62.5	18.8	18.7
	Cortical remains	11	27.2	45.6	27.2
Severe loss of vitreous	Intracapsular	17	53.0	29.4	17.6
	Extracapsular	10	30.0	50.0	20.0
	Cortical remains	8	25.0	12.5	62.5

\* Excluding those without adequate postoperative refraction or with extraneous causes of poor vision; for example, senile macular degeneration.

spect to the final visual result. The previous figures have shown the undesirable effects of either retained lens material or vitreous loss. If the capsule ruptures inadvertently during an attempted intracapsular extraction, the objectionable effects of residual capsule or cortex must be balanced against the danger of vitreous loss should the attempt be made to remove the residual lens material (table 5). A comparison of the visual results shows that severe vitreous loss and cortical remains are equally deleterious. However, while simple presentation of the vitreous is slightly more detrimental than leaving capsular remains, it is not nearly so seri-

ous as leaving lens cortex in the eye. From this, it would appear justifiable to attempt the removal of lens cortex in all cases even at the possible expense of vitreous loss. On the other hand, the removal of purely capsular material is advisable only if such an attempt is not accompanied by undue hazard of breaking the hyaloid membrane.

3. *Sutures.* Analysis of the data on the basis of sutures alone confirms the previous impression that tight closure of the corneal wound decreases gaping of the wound, prolapse of the iris, and final astigmatism (table 6). In extractions complicated by loss of vitreous, corneo-

TABLE 6  
INFLUENCE OF SUTURES ON POSTOPERATIVE COMPLICATIONS

Sutures	No. of Cases	Anterior-Chamber Hemorrhage percent	Incomplete Closure of Corneal Wound percent	Prolapse of Iris percent	Average Astigmatism diopters.
None	390	7.7	4.9	4.1	2.7
Conjunctival	629	12.2	4.1	4.9	2.5
Corneoscleral (one)	482	13.3	1.2	2.7	1.7
Corneoscleral (two)	558	4.7	1.4	1.6	1.4

TABLE 6a

EFFECT OF CORNEO-SCLERAL SUTURES ON REDUCING SOME COMPLICATIONS OF VITREOUS LOSS

Loss of vitreous	Corneoscleral Sutures	No. of Cases	Incomplete Closure of Wound (7 days) percent	No. of Cases	Astigmatism 5D or More percent
None	None	838	2.3	559	9.8
	Present	861	0.9	602	1.0
Presentation or loss	None	170	14.7	102	27.0
	Present	169	3.5	106	1.9

scleral sutures even more significantly reduced the likelihood of incomplete closure of the corneal wound and a high degree of astigmatism (table 6a). The use of two corneoscleral sutures (table 6) has reduced the incidence of anterior-chamber hemorrhages. The relatively low incidence of anterior-chamber hemorrhages in those cases in which no sutures were used might be accounted for by the shallow corneal sections in vogue at that time.

The use of sutures has been associated with an increase of purulent endophthalmitis, but, as Guyton and Woods have indicated,<sup>2</sup> this complication can be eliminated by the use of prophylactic sulfadiazine systemically for the first few days after operation (table 6b). The local use of chemotherapeutic agents is not so efficacious. When 5-percent sulfathiazole ointment was used locally in the eye immediately after the operation and usually at each dressing thereafter, two patients of 116 so treated developed purulent ophthalmitis, although stitch abscesses were not encountered. Additional measures that have effectively prevented this complication include an iodine-alcohol clean-up of the skin instead of merthiolate, metaphen, or zephiran, and careful draping in order to cover completely the nose, brow, and most of the skin.

Difficulty was encountered occasionally

in the removal of corneoscleral sutures. The anterior chamber was lost either during the removal of sutures or more frequently was found collapsed the following day in 3.7 percent of 1,030 cases. Serious gaping of the wound rarely ensued, and the anterior chamber ordinarily re-formed within 48-hours. Small anterior-chamber hemorrhages occurred at the time of removal of sutures in 3.6

TABLE 6b

RELATION OF SUTURES AND PROPHYLACTIC SULFADIAZINE TO POSTOPERATIVE PURULENT ENDOPHTHALMITIS

Sutures	No. of Cases	Purulent Endophthalmitis percent
None	389	0.5
Conjunctival	628	1.0
Corneoscleral	648	1.7
No sulfadiazine		
Corneoscleral		
Prophylactic	276	0
Sulfadiazine		

percent of the 1,030 cases. If the suture is deeply placed or if the patient is uncoöperative, removal of sutures can be postponed beyond the tenth postoperative day, and removal will be easier one or two weeks after discharge from the hospital.

4. *Iridectomy.* In the entire series round-pupil extractions have been compli-

TABLE 7  
RELATION OF TYPE OF IRIDECTOMY TO LOSS  
OF VITREOUS

Iridectomy	No. of Cases	Loss of Vitreous percent
Round pupil	444	2.7
Complete iridectomy	1635	10.6

cated by loss of vitreous less often than when extractions were preceded by a full iridectomy (table 7). It was not the usual procedure to perform an iridectomy following the loss of vitreous during a round-pupil extraction. However, when there was an accidental rupture of the capsule, a full iridectomy was often performed on the previously round pupil to facilitate the removal of capsular and cortical remains.

It has been suggested that the attempt to remove the cataractous lens through a round pupil increases the danger of rupture of the capsule. This is true in the extraction of hypermature lenses, especially when the pupils are rigid and dilate poorly with mydriatics. However, this factor was not important in the usual case of our series. The incidence of

TABLE 8  
POSSIBLE FACTORS IN THE PRODUCTION OF  
SECONDARY GLAUCOMA AFTER  
CATARACT EXTRACTION

Complication		No. of Cases	Secondary Glaucoma percent
Iridocyclitis	Present	144	19.4
	Absent	1919	3.1
Flat anterior chamber over seven days	Present	23	17.4
	Absent	2062	4.3
Capsular and cortical remains (without iridocyclitis)	Cortex	123	6.5
	Capsule	788	4.1
	None	1008	1.9
Presentation or loss vitreous (without iridocyclitis)	Loss	296	4.1
	None	1615	2.9

broken capsules became lower during the last five years when round-pupil intracapsular extractions were attempted in practically every case.

Postoperative anterior-chamber hemorrhages have only a suggestive relationship to the degree of iris trauma at operation.

5. *Factors in the production of secondary glaucoma.* The development of postoperative iridocyclitis, either from residual lens cortex or from loss of vitreous, predisposed to the development of secondary glaucoma (table 8). Other factors that have a suggestive but not statistically significant relation to secondary glaucoma in this series are: nonre-formation of the anterior chamber for at least seven days after operation, capsular and cortical remains without associated iridocyclitis, and presentation or loss of vitreous without iridocyclitis.

#### INFLUENCE OF GENERAL MEDICAL CONDITIONS ON POSTOPERATIVE COMPLICATIONS

-1. *Foci of infection.* Many of the patients, particularly in the earlier days of the Wilmer Institute, underwent a thorough search for foci of systemic infection prior to operation for cataract. This included a general physical examination by the interne, routine consultation with the nose and throat department (usually including X-ray studies of the sinuses), dental consultation with X rays, consultations with the gynecologic or urologic departments if indicated, blood Wassermann test, urine examination, and often tuberculin-sensitivity tests and X ray of the chest. An analysis of the incidence of postoperative iridocyclitis in relation to preoperative foci of infection revealed a curious finding in the group of patients subjected to extracapsular extraction (table 9). In this group, the patients whose foci of infection (in teeth

or sinuses) were either untreated or inadequately treated showed essentially the same incidence of postoperative iridocyclitis as those with no demonstrable focus of infection. However, the patients whose foci of infection were adequately treated prior to the extracapsular extraction developed postoperative iridocyclitis much less frequently than either the untreated and inadequately treated group or the group with no demonstrable focus of infection. An explanation of this finding is not readily apparent and will be the subject of a future report.

2. *Diabetes.* Only those diabetics who had had diabetes for nine years or more, or required 30 units or more of insulin showed any increase in postoperative complications (table 10). These groups were more prone to develop severe anterior-chamber hemorrhages, defined in this study as either a single hemorrhage completely filling the anterior chamber or smaller recurrent hemorrhages. No significant correlation was obtained between the height of the pre- or postoperative blood sugar, insulin shock, or diabetic acidosis, and any postoperative complication.

3. *Systemic hypertension.* No relationship was obtained between the height of either systolic or diastolic blood pressure and any postoperative complication. Two out of the three patients who developed expulsive choroidal hemorrhages and normal blood pressure, but all were over 70 years of age.

4. *Syphilis.* In this study 105 patients had late and usually latent syphilis. They showed no tendency toward increased postoperative complications. No difference was found between treated and untreated syphilitics.

#### DISCUSSION

*Iridocyclitis.* The relative importance of the etiologic factors in postoperative

TABLE 9

RELATION OF PREOPERATIVE SURVEY AND POST-  
OPERATIVE IRIDOCYCLITIS AFTER  
EXTRACAPSULAR EXTRACTIONS

Survey	No. of Cases	Irido- cyclitis percent
No focus	372	14.5
Focus		
Inadequate treatment	126	16.7
Focus		
Adequate treatment	115	4.4

iridocyclitis is somewhat uncertain. A survey of the literature reveals that iridocyclitis follows extracapsular more frequently than it does intracapsular extractions,<sup>3</sup> and we have found that the presence of retained lens cortex widens this difference. The most credible reasons why lens capsule and cortex should predispose to the development of postoperative iridocyclitis are (1) that bacteria are introduced into the residual lens material at the time of operation and therein find a good culture medium for growth, (2) that the individual becomes sensitized to his own lens protein and may develop varying degrees of endophthalmitis phacoanaphylactica, and (3) that lens material has intrinsic toxicity.<sup>4</sup> In regard

TABLE 10

RELATION OF SEVERITY OF DIABETES TO SEVERE  
POSTOPERATIVE ANTERIOR-CHAMBER  
HEMORRHAGE

Severity of Diabetes	No. of Cases	Severe Anterior- Chamber Hemorrhage percent
Duration less than 9 years	166	1.8
Duration 9 years or more	58	10.4
Insulin per day less than 30 units	169	1.8
Insulin per day 30 units or more	55	10.9
Duration 9 years or more and insulin per day 30 units or more	19	21.0



to the possible factor of infection, we found that the incidence of purulent endophthalmitis was no higher in extracapsular than in intracapsular extractions, and was lowest in eyes with retained cortex. If infection were usually present in the cortical remains of eyes with iridocyclitis, it would be surprising

tion possess this hypersensitivity to lens protein. A compilation of the data from the literature<sup>6</sup> shows that the cutaneous test for lens protein becomes positive in the large majority of cases with postoperative iridocyclitis (table 11). It may be that low-grade infection or a toxin facilitates such a sensitization to lens pro-

TABLE 11

INCIDENCE OF POSITIVE LENS PROTEIN INTRACUTANEOUS TESTS IN PATIENTS WITH POSTOPERATIVE IRIDOCYCLITIS<sup>6</sup>

Postoperative Iridocyclitis	Author	No. of Cases	No. of Positive Skin Tests
Present	Verhoeff and Lemoine, 1922	12	12
	Lemoine and Macdonald, 1924	9	9
	Gifford and Steinberg, 1925	14	6
	Goodman, 1932	42	38
	Hughes and Owens, 1944	25	12
	TOTAL	102	77 (75%)
Absent	Verhoeff and Lemoine, 1922	28	0
	Lemoine and Macdonald, 1924	150	6
	Gifford and Steinberg, 1925	72	5
	Goodman, 1932	658	80
	Hughes and Owens, 1944	21	8
	TOTAL	929	99 (11%)

that purulent endophthalmitis did not develop more frequently. Also we did not find that the prophylactic use of sulfadiazine had a significant effect on the prevention of iridocyclitis, although it is likely that sulfadiazine does not penetrate well into lens cortex. Infection also appears unlikely in those cases which do not develop iridocyclitis until several weeks after the operation. Reports in the literature indicate that such cases of late iridocyclitis often show evidence of cutaneous sensitivity to lens protein, and frequently respond well to lens-protein desensitization. A few of the reported cases with evidence of lens sensitivity have come to enucleation, and have shown the histologic picture of endophthalmitis phaco-anaphylactica.<sup>5</sup> The question arises whether most of the cases with iridocyclitis following extracapsular extrac-

tein, as Burky has shown experimentally with staphylococcus toxin in rabbits.<sup>7</sup> This may be the role of foci of infection in the sinuses<sup>8</sup> or teeth.

#### SUMMARY AND CONCLUSIONS

The gradual but radical changes in the technique of extraction of uncomplicated senile cataract during the past 19 years at the Wilmer Institute have brought about a steady improvement in final results. Statistical analysis of 2,086 extractions has shown that: (1) the amount of lens capsule and cortex remaining after an extracapsular extraction is directly related to the development of postoperative iridocyclitis, which, in turn, is the main factor in the production of secondary glaucoma; (2) loss of vitreous predisposes to postoperative simple detachment of the retina, persistent vitreous

opacities, and iridocyclitis; (3) corneo-scleral sutures reduce the incidence of incomplete closure of the wound, prolapse of iris, the amount of final astigmatism, and, with two sutures, anterior-chamber hemorrhages; (4) preservation of the round pupil reduces the likelihood of vitreous loss; (5) diabetes of long standing or requiring 30 units of insulin

or more per day predisposes to the development of severe anterior-chamber hemorrhages, but there is no correlation between the height of the blood-sugar and postoperative complications; (6) syphilis, either treated or untreated, and systemic hypertension have no significant influence on the occurrence of postoperative complications.

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## REPAIR FOLLOWING TUCKING OPERATIONS ON THE EXTRAOCULAR MUSCLES\*

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Since the early part of nineteenth century many articles have appeared in the literature concerning operations on the extraocular muscles for strabismus. But, so far as can be ascertained, only two papers have been published on the study of repair following such operations. The first systematic attempt to study this problem was apparently made by Carroll and Blake.<sup>1</sup> Since then Gifford<sup>2</sup> has observed the position of extraocular muscles after operations for strabismus.

In the study of repair following operations on the extraocular muscles Carroll and Blake used adult rabbits as the experimental animals. For anesthesia they used sodium amytal or pentobarbital sodium intraperitoneally. They used ingenious methods to hold the animal in a suitable position from which it could not move. The animals were killed 2 to 40 days after the operation by electrocution or ether. The following operations were performed on the rabbits' muscles: simple tenotomy, attachment of the muscles to the sclera by sutures, tucking, and resection.

Chouké and Whitehead<sup>3</sup> have shown that healing of skeletal muscle of dogs and rats occurs by fibrous connective-tissue growth from the epi-, peri-, and endomysium, and not through regeneration of muscle cells. They also found that the union of muscle to muscle is complete 8 to 11 days after suture.

The experiments here reported were performed on dogs to see whether the repair following operations on extraocular muscles was similar to or different from the results obtained in the case of rabbits by Carroll and Blake. Another object of these experiments was to compare the repair of extraocular muscles with the repair of skeletal muscle in general, since Irvine<sup>4</sup> has shown that many peculiarities distinguish the ocular from other striated muscles, both in man and in lower animals. Embryologically, in man, there is a possibility of splanchnic origin for the ocular muscles, according to Irvine. Histologically, ocular muscles differ from skeletal muscle in having unusually fine fibers, excessive amounts of elastic tissue, unusual fibers with encircling fibrillae, fibers rich in sarcoplasm, and others with interlacing fibrillae. This picture is somewhat similar to that seen in degenerating muscle in myxedema and various myopathies.

From an anatomic point of view the extrinsic ocular neuro-muscular structure of man is differentiated earlier in the phylogenetic history than the striated musculature elsewhere in the body. A good historical account of muscle tucking is given by Burch and Grant.<sup>5, 6</sup> Therefore it will not be repeated here.

The results of simple tenotomy, attachment of the muscles to the sclera by sutures, and resection obtained by Carroll and Blake have been confirmed by Gifford. Only two tenotomies were performed on dogs by the present writer. One of these was accidental, for the animal was physically so weak that while the tucking operation was being completed,

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the muscle broke in two almost at its center; it should probably therefore be called a myotomy. The other was intentional and was performed practically in the same manner as simple tenotomy is done for human cases of strabismus. The results of both these operations were for all practical purposes identical with those of Carroll and Blake on the rabbits and those of Gifford on the human eye. In other words, the muscle was found attached to the sclera behind the original insertion in the case of the intentional tenotomy. This animal was killed 28 days after the operation. But in the case of the accidental myotomy the attachment of the proximal end of the muscle could not be definitely established. As stated, the physical condition of this animal was very poor; this may possibly account for no definitely visible gross attachment of the muscle to the sclera. Even though the animal was kept alive for 120 days after the operation, its general physical condition did not show any improvement. Since the results of the operations on these two dogs agreed with those of Carroll and Blake and of Gifford, no further simple tenotomies were performed.

Extraocular muscles were subjected to 38 tucking operations in a series of 20 adult dogs. The experimental animals, as has been mentioned, were all adult dogs. They varied in weight from 7 to 19 kilograms. The animals were killed from 1 to 155 days after the operation by chloroform or ether, excepting one which was bled to death under sodium amytal anesthesia, since its blood was needed for an experiment connected with a war problem. Sodium amytal, 15 mg. per cubic centimeter per kilogram of body weight, was injected intraperitoneally. In a few cases toward the end of the operation a few whiffs of ether were given to keep the animal quiet. In six animals sodium

amytal, 10 mg. per cubic centimeter per kilogram of body weight, was injected intravenously; the results of this method of anesthesia were at least as satisfactory, if not more so, as the intraperitoneal method. The animal was ready for operation in less than 10 minutes after the intravenous injection of sodium amytal, thus proving the latter to be a time-saving procedure. There was only one death in this series that could be attributed directly to an overdose of anesthetic. Two other animals died within 24 hours after the operation; no definite cause of death, however, could be established.

Thirty-eight tucking operations were performed involving either the lateral rectus or the superior rectus muscle. The instrument employed was in some cases Todd's tucker; in others Harrison's or Speas's tucker was used. In a few cases a tuck was placed with a Roberts tucker in the muscle at a distance of 3 to 8 mm. from its insertion, two single silk sutures being used.

## RESULTS

*Gross.* All wounds appeared to be completely healed within 12 days after the operation. Black-silk sutures could be seen easily, thus marking the site of the tuck. The tuck in all cases was covered over by connective tissue. The union appeared to be as firm as in the normal attachment of extraocular muscles to the sclera. In other words, the muscle with a tuck could stand as much pull on it as a normal undisturbed extraocular muscle. In several animals the muscles were seen to be attached to the sclera at or near the point of the tuck. In four cases the two ends of the muscle on either side of the tuck responded to electrical stimulation. A definite twitching of the muscle could be seen after the application of a double fine electrode to either end of the muscle.

*Microscopic.* Twenty-four to 48 hours after the operation a definite foreign-body reaction had started near the site of the suture. About the fourth postoperative day some of the muscle fibers in the tuck were seen to be disintegrating. Many young fibroblasts, some polymorphonuclear

By the twelfth postoperative day there was a larger amount of fibrous connective tissue replacing the muscle fibers. Foreign-body reaction and granulation tissue were still present. Union of the muscle to the sclera was visible in the region of the tuck in addition to the union between

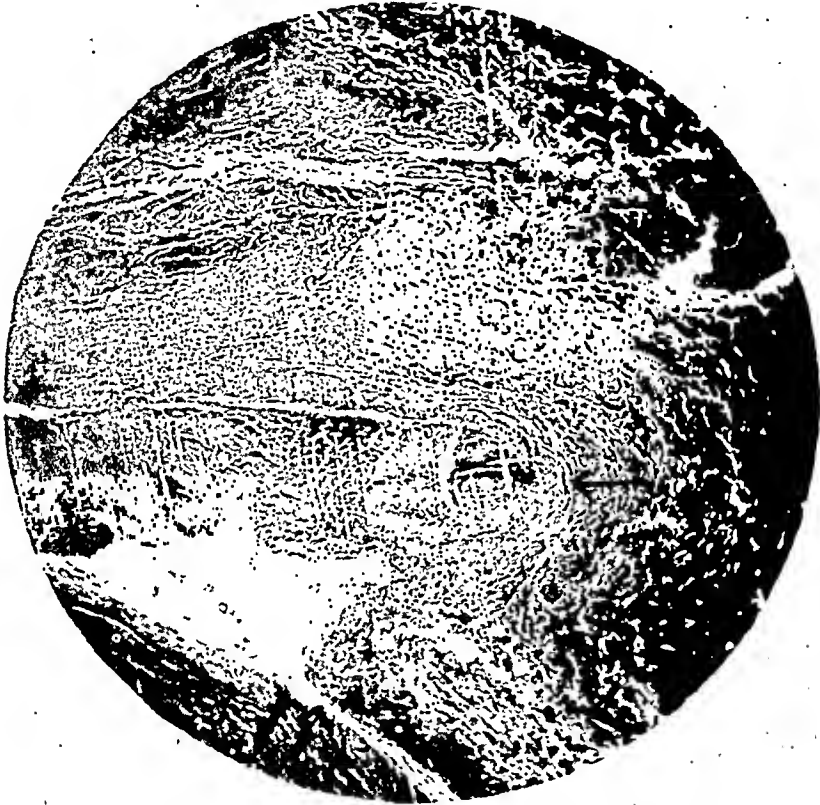


Fig. 1 (Chouké). Results of tucking on the nineteenth day. The loop of the muscle is shown in this figure in addition to the attachment of the muscle to the sclera (see arrows). H and E stain;  $\times 50$ .

clear cells, a few small round cells, and a very small amount of fibrin were noted. Probably these conditions were caused by the trauma to the muscle.

On the seventh postoperative day there was seen a dense cellular reaction consisting mainly of small and large mononuclear cells. Many fibroblasts and round cells were also seen in addition to some granulation tissue among the muscle fibers.

the two parts of the muscle to each other. The appearance of the sections on the sixteenth postoperative day was practically the same as that for the twelfth postoperative day.

On the nineteenth postoperative day there was some foreign-body reaction around the silk sutures. In the photomicrograph of a section taken on the nineteenth postoperative day (fig. 1) a loop of the muscle and its attachment to

the sclera can be seen, with slight cellular reaction. Necrotic fibers of the muscle mentioned under the fourth postoperative day are not seen at this stage; apparently they have been absorbed.

On the twenty-eighth postoperative day

cle on either side of the tuck is connected by fibrous connective-tissue scar (fig. 3). Two silk sutures are still present. Under the suture on the left side of the figure attachment of the muscle to the sclera can be seen. Adjacent to the right suture



Fig. 2 (Chouké). Results of tucking on the thirtieth day. Complete loop of the lateral rectus muscle is seen. The lower part of the figure shows the attachment of the muscle to the sclera. H and E stain;  $\times 50$ .

some muscle fibers have been replaced by scar tissue. Foreign-body reaction is still present around the silk sutures.

On the thirtieth postoperative day a complete loop of the muscle can be seen. Its attachment to the sclera is also visible. There is a noticeably small amount of scar tissue in this section (fig. 2), except at the junction of the muscle with the sclera.

On the thirty-fifth postoperative day the tuck is seen in the center and the mus-

some foreign-body reaction is still present.

During the period between the 35th and 155th postoperative days there is hardly any noticeable difference in the gross picture or in the microscopic appearance of the tissues.

The muscle attachment was accomplished by organization of fibrin and by granulation tissue. Carroll and Blake<sup>7</sup> also express the same opinion in the following words: "In tucking and resection, the

end result depends upon a bridge of strong connective tissue uniting the loops of the tuck, or the severed parts of the muscle. Occasionally the muscle becomes attached at some distance from the desired point." These observations seem to agree with the statement of Gifford: "It would appear from these findings that necrosis of muscle fibers would actually shorten the muscle more than the calculated amount while the amount of relaxa-

by ophthalmic surgeons in different parts of this country.

#### SUMMARY

After a tucking operation the two adjacent sides of the loop of muscle join together by means of fibrous connective tissue. The side of the muscle nearest the eyeball quite often, but not always, becomes attached to the sclera by fibrous connective tissue. The process of repair

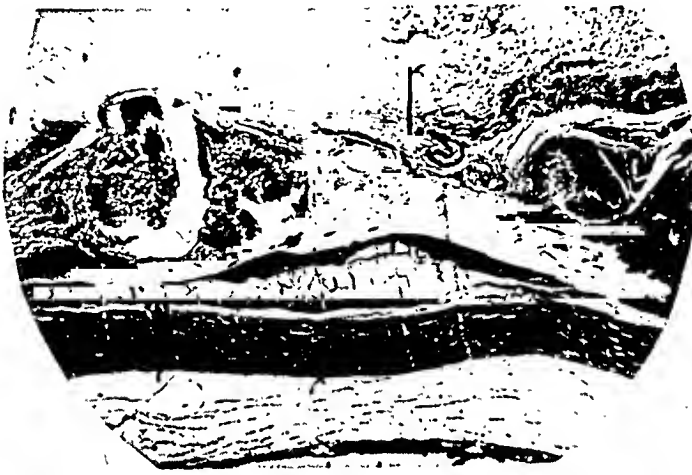


Fig. 3 (Chouké). Results of tucking on the thirty-fifth day. The tuck is seen in the center and the muscle on either side of the tuck connected by fibrous connective tissue. Under the left suture, attachment of the muscle to the sclera can be seen. H and E stain;  $\times 25$ .

tion of the muscle due to the formation of granulation tissue was a variable quantity."<sup>2</sup> He also found some adhesions between muscle and sclera 3 to 4 mm. posterior to the tuck. This is quite in agreement with the present observations noted above under the twelfth postoperative day findings. According to him: "Such adhesions might be expected to neutralize completely the effect of the tuck and possibly to limit motion in the field of the muscle." This comment by Gifford is significant and may explain, at least partially, the reasons for performing fewer and fewer tucking operations for strabismus

of extraocular muscles in the dog is essentially similar to that of the skeletal muscles elsewhere in the body. The time required for the completion of repair of extraocular muscles is slightly longer than that for general skeletal muscles of the same animal. The continuity of the muscle is preserved after the tucking operation, as evidenced by response to electrical stimulation.

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## CORNEAL DYSTROPHIES

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There has been much confusion in the ophthalmic literature in the description and classification of hereditary corneal dystrophies during the past 50 years.<sup>1</sup> Within the past decade Buecklers<sup>2</sup> initiated a first step toward an orderly classification by isolating three main clinically separate types. Twelve family groups consisting of 800 living in 35 small communities in Wuerttemberg were examined by Buecklers and his associate Gilch. Among these were 119 individuals presenting the three morphologically different types.

## BUECKLERS'S TRIAD

1. *Dystrophia corneae granulosa* (Fleischer's type), "broeckelige," granular-disc form. This type may begin as early as the fifth year and progresses slowly until the thirtieth or fortieth year. Two family groups included 68 cases, showing dominance in heredity. The changes in this type are within a central disciform area. There is a clear marginal border. The individual lesions resemble dried bread crumbs in form. The slitlamp

shows the opacities in the areas of the interlamellar cement substance with no preference as to depth. The epithelium is rarely involved. However, I saw a case in 1925, which presented added superficial, definitely circinate lesions. I have seen a three-case group of a mother and two daughters. An interesting case of this type has been under my constant observation for over 20 years. The patient is now 50 years old. During this period, because of slow progression of the lesion, the vision dropped from 20/80 to 12/200. Castroviejo, 6½ years ago, performed a corneal transplant in this case. This granular disciform type is the most common among hereditary dystrophies. Buecklers in 1938 reported a histologic examination, and his conclusion was that the granular substance was a keratohyalin originating *in situ*.

2. *Dystrophia corneae reticulata* (Haab-Dimmer type), "gittrige," lattice. In 1898 Haab and Dimmer described the well-known lattice form of corneal dystrophy. It is composed of irregular double-contoured lines, often split at their ends.



They are in part superficial and glassy in character. In some of the cases which I have seen, there seemed to be a relative sparing of the pupillary area in the incipience.

I have seen three cases in one family at the Illinois Eye and Ear Infirmary, and two cases of a family group of father and five of eight adult siblings involved. Therefore, this type is dominantly hereditary. In the first three cases in one family the lesions were all large and coarse. In the second group the lines were faint and dainty in contour. These cases were sent to me for contact-glass trial. The vision in one eye was improvable from 20/120 with glasses to 20/30—3 with a contact glass. The patient was impressed, but not interested.

3. *Dystrophia corneae maculosa* (Groenouw type), *fleckige-knötchenförmige, spotted, at times nodular*. Groenouw first described a granular dystrophy in 1890 which later became known as the Fleischer type. During the same year he also described a spotted nodular type which bears his name. This initiated some of the confusion in the literature. These two types, the granular and nodular, were for some time designated as Groenouw type 1, and type 2 in European literature. In the Groenouw dystrophy the lesions begin early in the second decade of life as a diffuse spotting composed of faint, more or less rounded, superficial and deep cloudings. These extend to the limbus. They increase in number and density and later may become elevated and nodular, and by their interference may lead to practical blindness in old age. From his study Buecklers thinks the heredity is recessive. Family groups are not frequently found. I have seen only a few well-advanced cases of Groenouw dystrophy, more of moderate involvement.

Buecklers believes that each of these

three types of corneal hereditary dystrophy presents a definite clinical entity. He suggests that the term "familial dystrophy" as a description of all types be abandoned. Latin names were evolved descriptive of the three clinical types. The terms *granulosa*, *maculosa*, and *reticulata* were adopted in the Buecklers monograph.

#### FUCHS'S EPITHELIAL DYSTROPHY

This condition presents a chronic edema of the epithelium especially of the central corneal area. The cells are swollen and there may be droplets between them giving the appearance of glassy beads. It is similar to the slitlamp picture we see in glaucoma when the eyeball is under high tension. In old cases of Fuchs's dystrophy and in old glaucomatous eyes the epithelium develops a chronic degenerative vacuole formation. In Fuchs's dystrophy the central corneal epithelium presents this change because of the stromal imbibition of water derived from the aqueous. The great majority of epithelial dystrophies are secondary, owing to a senile cornea guttata. In these cases clear elevated humps protrude from the back of Descemet's membrane (Hassal-Henle Descemeti warts.) These humps elevate the endothelial cells. The raised endothelium is thus exposed to the trauma of the convection current within the anterior chamber. These elevated cells gradually degenerate. They lose their physiologic-barrier function, which normally keeps the aqueous from infiltrating into the corneal stroma. Pigment in the aqueous often attaches itself to this roughened, middle-posterior corneal surface.

A moderate amount of Hassal-Henle warts in the corneal center are a common senile slitlamp finding. When this formation becomes very pronounced the quite rare condition of Fuchs's epithelial dystrophy develops. There is no hyper-

tension. A few cases of Fuchs's epithelial dystrophy have been seen, with no visible endothelial changes or cornea guttata. These may present some as yet unknown dysfunction of the endothelial barrier. Meesmann has seen cases dominantly hereditary in which the endothelium appeared normal. This is difficult of determination, for the epithelial edema obscures the picture.

#### SALZMANN'S NODULAR DYSTROPHY

This type of dystrophy was first reported in 1925. It differs from Groenouw's in that the lesions are fewer and there is a vascularization. Vogt calls a similar condition keratitis tuberosa, and shows a typical case in his Atlas. The vascularization surrounds the nodules, but does not invade them. This is also shown in the illustrations of cases reported by E. V. L. Brown and Dewey Katz. Characteristic old corneal scars following phlyctenulosis are usually found in the same patient.

Five out of the 23 cases first reported by Salzmann were bilateral.

I have a kodachrome of a Salzmann nodular dystrophy in a man, aged 58 years, whom I saw over a year ago at Rush Medical Clinic. The patient was sent from the County Hospital. The condition was unilateral. There was a group of large elevated nodules. There was no vascularization, nor were there evidences

of old phlyctenular lesions. In this it resembled an advanced case of Groenouw's nodular dystrophy and could be so diagnosed, if it had been bilateral.

#### KERATOCONUS

Keratoconus is a corneal dystrophy, due to the development of a congenitally ordained central stromal weakness. The common lesions, conus formation, apical reflex, Fleischer's ring, Vogt stripes, superficial scar formation, and rupture in Descemet's membrane (the latter in only very advanced cases), are all due to the mechanical distortion incidental to the conus development. The clinical picture is well known.

I have a first edition of a book, probably the first one ever published concerning the cornea, entitled—"A treatise of the diseases of the horny coat of the eye," by Benedict Duddell, surgeon and oculist, published in London, in 1729. On page 32 there is given the first authentic description of conical cornea in the following words:

I saw a poor Boy at Hammersmith, that was blind of one Eye from Abscesses that had mined through the Blades of the Horney-Coat; and the Cicatrices following made a great Opacity, which hinder'd the Rays from Passing through the Coat. The cornea of his other Eye was swell'd out towards his Nose to the Bigness of half a Pea, and was transparent in the swell'd Part; the other Part of the Cornea was opaque; he cou'd see very well on that Side of his Eye next to his Nose.

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# DEFINITION OF ANOMALOUS RETINAL CORRESPONDENCE\*

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In a recent article on ocular terminology, Lancaster,<sup>1</sup> speaking for the American Committee on Optics and Visual Physiology, presented definitions<sup>†</sup> of anomalous retinal correspondence and related phenomena. One definition described an anomalous retinal correspondence as a condition in which the fovea of one retina and an eccentric element of the other acquired a common visual direction; that is, became corresponding retinal points. A review of the literature reveals this simple definition to be in common usage. Unfortunately, such a functional relationship between the fovea of the fixating eye and a peripheral retinal area in the squinting eye can be demonstrated in few patients with anomalous retinal correspondence. Moreover, attempts to use the definition as a criterion for diagnosis have misled some ophthalmologists to believe the anomaly rare. This fact is exemplified by a comparison of 100 cases

of esotropia selected at random from admissions to the State University of Iowa Clinics in 1935 with 100 consecutive cases admitted in 1942. Of the 1935 group, only three were suspected of having some anomaly of correspondence, whereas a definite diagnosis of anomalous retinal correspondence was made in 73 percent of the 1942 group. New criteria for diagnosis and improved methods of examination account for the discrepancy rather than does an increased incidence of the anomaly. In 1935, the orthoptist used an illuminated Brewster-Holmes type of prism stereoscope so adjusted that when one target was fixated by the fovea of the nonsquinting eye, the other target stimulated that peripheral retinal area of the squinting eye which, according to the aforementioned definition, could become a functionally corresponding point. Correspondence was considered abnormal only if the two objects

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† *Corresponding points*: Points on the two retinas which have the same relative directional spatial value. For every point on the retina of one eye (except for the temporal crescent of each unocular field which is not included in the binocular field of vision, and except for the blind spot); there is a point on the retina of the other eye, stimulation of which gives the same sensation of direction. The foveas are the corresponding points *par excellence*.

Retinal correspondence is not an anatomic peculiarity innate and unchangeable. In squint, *anomalous correspondence* frequently develops. In this condition a different point of the retina of the squinting eye acquires a more or less perfect correspondence with a point of the nonsquinting eye. This is *secondary correspondence*, or anomalous correspondence. Another definition: If elements of the two retinas—for example, the fovea of one and an eccentric element of the other retina—acquire a common visual direction, this new sensorial relationship is termed anomalous or secondary.

*Angle of anomaly* (Bielschowsky), *angle of adaptation* (Chavasse): When an eye has deviated a long time, a certain amount of adaptation may take place. The fovea of one eye no longer has the same directional value as the fovea of the other eye, but instead some peripheral point of the retina of the deviating eye acquires a directional value corresponding to the fovea of the fixating eye. This is secondary or anomalous correspondence. The angle between the line of direction of the fovea and the line of direction of this new point, which corresponds in directional value with the fovea of the other eye, is the angle of adaptation or the angle of anomaly.

*Harmonious correspondence*. If the angle of anomaly or of adaptation is equal to the angle of deviation, the secondary correspondence (anomalous correspondence) is called harmonious. The point of the retina of the deviating eye on which the image of the point of fixation falls is the point that has acquired correspondence with the fovea of the fixating eye. Sometimes (often) it is not this point but some point between it and the fovea that corresponds with the fovea of the fixating eye. Then the correspondence is subharmonious (Chavasse).

were perceived as superimposed; a finding that was rarely recorded. The fallacy of the test and consequently of the definition became evident when determination of the field of binocular vision became a routine procedure.

Several methods were used to plot the field of vision of the squinting eye while the patient maintained fixation and a full field of vision in the other eye. In one method, a mirror placed before the fixating eye separated the fields of vision. While this eye fixated a centrally placed target on one tangent screen, the field of vision of the squinting eye was plotted with 1- to 5-mm. white targets on a separate unmarked screen at distances of one to two meters. In another method, colored filters were used to separate the fields of vision of the two eyes. A red filter was placed before the fixating eye, and for fixation a small red disc of light was projected upon an unmarked white wall at distances of two to six meters. A green filter was placed before the squinting eye, and a tiny green disc of light was projected on the screen at various positions to plot the field of vision of the squinting eye. The patient was required to distinguish only the presence of the peripheral image, not its green color. The stereocampimeter provided a third method of examination.

With all methods it seemed that, in accordance with the findings of Travers,<sup>2</sup> the point of fixation was perceived only by the fixating eye in almost all cases of untreated nonparalytic esotropia. For example, patients with anomalous retinal correspondence described the target presented to the squinting eye as approaching the point of fixation, disappearing, and then reappearing on the opposite side. Rarely was the target described to be superimposed on the fixation point. This finding made evident the fallacy of applying the aforementioned definition to the diagnosis of anomalous correspondence.

How could the fovea of the fixating eye become a functionally corresponding point with a suppressed retinal area in the squinting eye?

Verhoeff<sup>3</sup> believes that both eyes, and particularly the two foveas, are habitually used simultaneously by squinters who are free from amblyopia. In almost every case of esotropia the field of vision showed some degree of suppression of the macular region of the squinting eye; however, excluding those patients with extramacular fixation and a large absolute central scotoma in the monocular field of vision, the macular region was found to retain a relatively high degree of form sense (equivalent to 5/60 to 6/21). Moreover, it was usually possible to demonstrate whether or not this partially suppressed macular area of the squinting eye retained the same visual direction as the macular region of the fixating eye. If objects were presented simultaneously to both maculas, the patient with esotropia and anomalous retinal correspondence had crossed diplopia with images separated by an angle approximating or slightly less than that of the squint; with normal correspondence, the images were superimposed. A number of tests for anomalous correspondence have been applied on this basis; for example, the after-image test of Tschermak.<sup>4</sup> All are so devised that when the macular regions are stimulated simultaneously, the patient is able to distinguish between the images of the two eyes and to visualize their relative visual directions. In recent years three methods of determining retinal correspondence have been used in the Iowa Clinic: afterimages, stereoscopic devices, and a projection system with color or polaroid filters.

These three types of tests do not always agree, but this is not an indication that one or the other test is incorrect or that the criterion for diagnosis is inadequate; rather it is an indication that correspond-

ence is variable. The abnormal relationship between the central retinal areas of the two eyes often is fixed at a constant angle (angle of anomaly), but in some patients, particularly those who have received treatment, it may be variable or even absent, depending upon the circumstances under which the test is performed. For example, in monocular squints it is not rare to find normal correspondence when the usually squinting eye is forced to fixate, but anomalous correspondence under other conditions. The correspondence also may vary with the intensity of the stimulus and the total area of the retina stimulated. Finally, anomalous and normal retinal correspondence frequently coexist in patients receiving treatment; that is, monocular diplopia in the squinting eye. This variability becomes evident only when more than one type of test is used routinely. It is one of the important characteristics of anomalous correspondence.

Anomalous correspondence tends to adapt itself to the deviation of the squinting eye. This fact is important, for it is another prevalent concept that simple changing of the deviation of the eyes by muscle surgery constitutes effective treatment. In the author's experience, this concept is erroneous. Several years ago nearly 100 esotropias with abnormal correspondence were corrected to within a few degrees of orthophoria by surgery. After a period of two to four months, the large angle of anomaly had disappeared in the majority of cases, but it was seldom possible to demonstrate fusion\* developing either spontaneously or after intensive orthoptic exercises. The failure to establish true fusion in most of these patients was explained when they were reexamined and especial care was used to stimulate exactly the foveal regions. Anomalous correspondence with variable angle of anomaly of only a few degrees

was repeatedly demonstrated. Moreover, it was exceedingly difficult to establish normal correspondence in these patients by orthoptics; the angle of anomaly was so small that it was practically impossible to adjust any instrument to stimulate simultaneously the desired retinal areas without at the same time stimulating the anomalously related areas. Prolonged occlusion (4 to 12 months) was also unsuccessful. Repeated examinations made during the past five years with an additional control group of 100 patients with abnormal correspondence treated surgically without orthoptics or occlusion provided further evidence that anomalous retinal correspondence tends to adapt itself to the deviation of the eyes; that is, a new variable angle of anomaly approximating the deviation of the eyes develops over a period of months. Therefore, when surgery is performed as an initial procedure in patients with anomalous retinal correspondence, immediate and intensive postoperative orthoptic exercises are desirable to establish normal correspondence and fusion before the anomalous correspondence *adapts itself to the new deviation*.

Pugh<sup>5</sup> has advocated the therapy outlined; that is, surgery followed immediately by intensive orthoptic training. The writer has found it more expedient to utilize another characteristic of anomalous correspondence; that is, its instability with disuse. Not infrequently the anomaly is disrupted by occlusion of one eye for several months. Prolonged occlusion is an essential first step in some cases, and in all instances shortens the period of supervised orthoptic training. Dicke<sup>6</sup> has also advocated a program utilizing preoperative occlusion.

#### DISCUSSION

Perhaps a definition of anomalous retinal correspondence need only include a correct example of the anomaly; for ex-

\* Maddox Grade II.

ample, the definition of Bielschowsky<sup>7</sup>: "The foveal images of the two eyes are not localized as in cases with normal correspondence in one and the same visual direction, but in different directions coinciding with the geometrical (foveal) lines of direction." However, mistakes such as those described will be generally fewer if the definition includes those outstanding characteristics of the anomaly which must be understood for proper diagnosis and treatment.

Objections to the definition in common use are summarized, and a new definition is presented including those characteristics that in the writer's experience are essential to proper diagnosis and treatment of anomalous retinal correspondence. Possibly there are other characteristics that should be included.

#### SUMMARY AND CONCLUSIONS

The prevalent definition of abnormal retinal correspondence as an anomaly in which the fovea of the fixating eye and a peripheral retinal area in the squinting eye become functionally corresponding points seems erroneous. Studies of the field of binocular vision reveal that the peripheral retinal area in question is almost invariably suppressed.

Unless there is a high degree of amblyopia the macular region of the squinting eye is only partially suppressed; consequently, demonstration that the foveal or macular regions of the two eyes are not corresponding points provides a prac-

tical method of diagnosing anomalous retinal correspondence in the great majority of patients. Afterimages, stereoscopic devices, or a filter projection system may be utilized to stimulate the macular regions and to determine their relative visual directions.

Anomalous retinal correspondence is not necessarily fixed at a constant angle of anomaly, but is frequently variable and tends to adapt itself to the deviation of the eyes. Experience with several hundred cases indicates that instead of completely disrupting abnormal retinal correspondence, muscle surgery alone usually results in a gradual change in the angle of anomaly to correspond with the new deviation.

Another characteristic of anomalous retinal correspondence is that it becomes unstable with disuse; that is, disruption of binocular vision. Prolonged monocular occlusion is an important adjunct in treatment of the anomaly.

In accordance with these findings, anomalous retinal correspondence is defined as an anomaly of binocular vision in which areas in the two retinas normally having a common visual direction—for example, the foveas—acquire an unstable and often variable visual direction in relation to each other but usually in accordance with the squinting position. The anomaly is always associated with some degree of suppression of the squinting eye, the point of fixation almost invariably being viewed monocularly.

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# THE USE OF CHOLINE IN CASES OF ULCER AND OF LEUKOMA OF THE CORNEA\*

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It may be that in the early days of medicine the term *cataract* was applied to any obscuration of vision, even to pathologic change in the innermost layers of the retina. The word *cataract* is derived from the Greek *kata*, down, and *arassein*, to fall. Anything that fell over and in front of the percipient elements of vision was to the people of that time a cataract.

In this more enlightened age we have appropriated the word to designate a pathologic condition of the crystalline lens. It is not unusual for even cultured individuals, those in the habit of analyzing words, to become confused when the word is applied to a particular pathologic state, for individuals forget that words are only arbitrary.

The subject of this contribution concerns the white cicatrices of the cornea and the ulcer responsible for such scars. It is desired to show that these ulcers can be aborted and that the agent used to this end can also be adopted to treat the scar that the ulcer leaves. It might have been preferable to present for consideration merely the bare facts and the simple demonstration and to leave speculation to the reader; however, it is not entirely possible to do so. The subject of choline must be treated somewhat more fully.

We appreciate the fact that scars of the cornea often diminish from childhood to adult life and that it is possible for man to imitate senescence in a scar and thereby reduce its size. How this is done is usually a matter of speculation. We

hope to demonstrate the action of choline on such scars.

Long ago bile was instilled into the eye to affect scars of this kind. We submit that a constituent of bile is the agent that induces the amelioration. Although bile contains but a small amount of this constituent—namely, choline—we are of the opinion that it may be the factor that accomplishes the desired results.

Choline will, in a remarkable manner, cleanse a moderate-sized corneal ulcer of pus, leaving the floor of the ulcer clear. Should the ulcer penetrate the cornea and there be pus in the anterior chamber of the eye—limited, however; not a panophthalmitis—choline will find the channel and search out the pus without injuring the tissues. Its performance is uncanny. Choline dissolves fibrin. It will “turn over” lipoids and cholesterol esters in cases of corneal leukoma, reducing the size of the leukoma.

We are not concerned here with determining whether choline is or is not, constitutionally, a vitamin, a vitagen, a hormone, or an enzyme; whether it is anti-hemorrhagic, lipotropic or what its effect on cholesterol esters is; we are interested in the fact that when applied topically to an ulcer of the cornea the pus is purged; when applied to a leukoma the cicatricial disfiguration is reduced. We have treated numerous ulcers of the cornea sufficiently to convince ourselves of its effect.

In the treatment of leukoma the results are most encouraging, but less spectacular than in the case of ulcers. We first test with fluorescein to discover if there is epithelial abrasion. Usually there is not.

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Then choline is instilled, followed by another test with fluorescein. The epithelium for the second time does not stain. However, the periphery of the leukoma does. In view of this evidence we conclude that choline has the power to penetrate the epithelium of the cornea and enter the corneal stroma. At first the direction of penetration is like ripples about the lesion, the action to be expected from a wetting agent; secondly, choline penetrates into the anterior chamber of the eye, the action one would expect from a polar, nonpolar chemical. If the lesion extends to the lens the course of the pathologic process will stain; however, we have not as yet been able to stain vitreous opacities. We have flooded the anterior chamber with a 1-percent solution of choline and without injuring the tissues.

Lipoids and cholesterol esters in scars of the eyes have been accorded very little attention in the past. Yet they are, in our opinion, of great importance in maintaining persistence of disease. Mustard-gas lesions of the cornea are an example of an irritation maintained by lipoids and cholesterol crystals. Choline changes lipoids into phospholipoids. The latter can be readily removed from the lesion and this is probably true of cholesterol esters also.

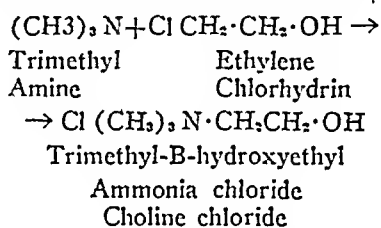
The action of choline upon pus will not be discussed here except to state its purging effect. It will liquefy pus in the test tube as well as fibrin and other substances.

Many chemicals have been applied to leukomas to reduce their size, but few have merit. Dionin is one of these. It is not lipotropic; choline is. Histologically, scars have been carefully studied, but only as static tissues; not as lesions in a functioning organ of multiple chemical processes in which there is incessant

change. One does not question the exact studies of the pathologist as regards static tissues, but his studies of lipoids and cholesterol in these tissues are not so careful; in fact, he destroys them.

The properties of choline, chemically, biochemically, and physiochemically, are deserving of attention.

Choline was probably first isolated fully 100 years ago, the original source being from the lecithin of liver secretion. It is a simple natural organic base and its chemical formula is as follows:  $C_5H_{15}NO_2$ , with a molecular weight of 121.13. It has a white color and a fishy odor. Synthetically it may be obtained by treating an aqueous solution of trimethylamine with ethylene oxide.



Choline is a strong base liberating ammonia from its salts and precipitating as hydroxide (from aqueous solution) the salts of the heavy metals. Its solution dissolves fibrin and prevents the coagulation of proteins. It appears that choline is involved in the metabolism of cholesterol as well as in that of the neutral fats.

Physiochemically, it is one of the most remarkable penetrating agents. Its molecule is both polar and nonpolar, and is soluble in either water or oil. It will readily combine with other drugs and staining agents and carry them deep into the tissues.

#### SUMMARY

Choline is a most promising agent in the treatment of ulcers of the cornea and of leukoma of the cornea. It should be applied topically in such conditions.



# NOTES, CASES, INSTRUMENTS

## INTRAOCULAR INJECTION OF PENICILLIN IN A CASE OF RING ABSCESS OF THE CORNEA

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Ring abscess of the cornea has always been a disease characterized by a poor prognosis and usually has resulted in perforation of the cornea with loss of the eye. The excellent results obtained by the use of penicillin injected into the anterior chamber and associated sulfadiazine therapy warrants the recording of this case of ring abscess.

### CASE REPORT

D. G., a woman, aged 29 years, was first seen at the Boston City Hospital Emergency Floor on January 23, 1944, complaining of photophobia, lacrimation, and pain in the right eye. The patient stated that on the previous day a foreign body had been removed from the corneal area by the use of a "clean handkerchief." On examination, a small localized ulceration was observed on the right cornea, with associated ciliary and conjunctival injection. No foreign body was present. Local therapy of warm boric-acid-solution compresses, White's ophthalmic ointment with 1-percent atropine, and a sterile dressing was advised.

On January 24th the patient reported to the Out-Patient Department with markedly increased severity of her symptoms. An ulceration, measuring 3 by 5 mm., with deep infiltration was found at the 3-o'clock position. Moderate ciliary congestion existed, and the iris was fully dilated. Tension was palpably soft, with

slight deep tenderness. Visual acuity at the time was O.D. 20/40, O.S. 20/30. The previously advised therapy was continued, the applications to be made at more frequent intervals.

Two days later the patient was seen in the Out-Patient Department. The ocular condition was found to be alarming, and admission to the Hospital was advised. A culture and smear of the cul-de-sac of the right eye were taken at 9:00 A.M. and later proved to be *B. pyocyaneus* and hemolytic *Staphylococcus aureus*.

*Physical examination.* The patient had an oral temperature of 101; pulse of 95, and respirations of 20 per minute. She was flushed and complained of chilliness. General physical examination revealed no other abnormalities; her blood pressure was 120/80.

*Right eye.* Erythema and slight edema of both lids were present, together with an almond-sized, tender, preauricular lymph node. Lacrimation and purulent exudate were profuse. No material was expressed from the lacrimal sac. The ciliary and bulbar conjunctival injection was intense and diffuse. There was no elevation of tension to fingers, but ocular tenderness was present. The cornea was opaque in its entire central area; a small rim of clear cornea approximately 2 to 3 mm. in width persisted between the lesion and the limbus. The clear area became narrower toward the nasal half of the cornea at the site of the original lesion. The involved corneal tissue was of blotter-paper appearance and stained readily with fluorescein solution. This area was opaque; a hypopyon filling one third of the anterior chamber was visible through the clearer areas. A distinct groove in the corneal surface, most marked on the nasal side, was present at the margin of the le-

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sion just proximal to the clear corneal area. A hazy outline of a dilated iris could be made out. Only light perception and projection could be elicited, but these were normal. Ocular motility was normal.

*Left eye.* External and fundic examination of this eye was entirely without pathologic findings.

The patient had had no significant illnesses nor familial diseases pertinent to her present condition. She was married, the mother of three children, and had always enjoyed good health. There had been no visual impairment nor previous ocular complaints, except that one month previously she had removed a minute foreign body from the cornea of the right eye, but without subsequent discomfort.

*Diagnosis:* 1. Ring abscess of the cornea, O.D.; 2. Hypopyon, O.D.

*Therapy.* The acuteness and gravity of the ocular picture warranted immediate and intensive therapy. The culture was repeated from the right cul-de-sac, and the organisms were the same as those previously found (*B. pyocyaneus*, hemolytic *Staphylococcus aureus*).

Fifteen million organisms of typhoid-vaccine diluted to a volume of 1 c.c. in physiologic saline (0.85 percent) were given intravenously. Although the temperature, pulse, and respiration readings were recorded hourly, no reaction was observed.

Simultaneously, oral sulfadiazine was administered. The initial dose of 2 gm. was followed by 1 gm. every four hours.

Hot boric-acid-solution compresses were instituted for the right eye, for a 10-minute interval every hour. Each hour 5-percent sulfadiazine ointment was instilled and followed by the application of a dry sterile dressing.

The Ophthalmic Service of the Boston City Hospital had had no previous experience with the use of penicillin in ocular conditions, but was granted the use of

50,000 Oxford units. An isotonic saline dilution of 250 units per c.c. had been suggested<sup>1</sup> for topical use. No literature nor information was available as a guide at the time in the intraocular use of penicillin, but, in view of the rapid progression and poor prognosis of ring abscess of the cornea, further delay was not warranted.

At nine o'clock on the evening of January 26th, and with observance of sterile operative technique, the right eye was prepared and local topical anesthesia obtained with 0.5-percent pontocaine. A saline solution containing 250 units per c.c. was prepared from the powdered, sterile, vial-contained penicillin. An empty 1-c.c. syringe fitted with a short, sharp needle was introduced at the limbus at the 3-o'clock position and directed toward 6 o'clock, according to a technique described by Igersheimer.<sup>2</sup> Care was taken to avoid the iris and prevent the needle from striking either the posterior corneal surface or the anterior lens surface. Approximately 0.3 c.c. of turbid aqueous was withdrawn. Leaving the needle in place, the syringe was detached and the contents emptied into a sterile culture tube. Another syringe was then partially filled with penicillin solution, reattached to the needle, and 0.3 c.c. ( $\pm 75$  units) was injected into the anterior chamber. The needle was withdrawn rapidly, and the conjunctival sac and cornea were flushed with 1 c.c. of penicillin solution. A dry sterile dressing without ointment was applied, and the patient was returned to the ward.

Because penicillin is altered at temperatures higher than 5°,<sup>3</sup> the prepared solution was placed in a refrigerator. It had seemed advisable to warm the syringe containing the penicillin in the palm of the gloved hand before the injection was made, lest the tissues fail to tolerate the chilled solution.

The culture report of the aspirated aqueous proved to be hemolytic *Staphylococcus aureus*.

Subsequent local therapy consisted of hourly hot boric-acid-solution compresses followed by a direct application of 1 c.c. of penicillin solution, drop by drop, to the cornea.

On January 27th the cornea showed slight improvement in that the density of the central yellowish opaque area had diminished, and thinning out seemed to appear superiorly. The corneal groove persisted. The hypopyon had lessened. A dilated pupil was more easily visualized, and the tension remained soft. Repetition of the intraocular instillation of penicillin seemed advisable and was performed. The procedure was identical, but culture of the aspirated fluid resulted in no growth!

On the following day a definite improvement was noted, with the absence of an hypopyon and a thinning of the central opacity, which had taken on a less necrotic appearance. Dr. Josef Igersheimer saw the patient in consultation and agreed with a diagnosis of ring abscess.

On January 31st progressive improvement of the corneal lesion was observed to have continued. The peripheral clear cornea persisted, and the density of the opacity lessened, receding toward the center. No synechiae were observed, but the pupil was kept dilated by instillation of one drop of 1-percent atropine sulfate solution on alternate days. The tension remained soft. The ciliary congestion persisted.

The oral administration of sulfadiazine was reduced to 4 gm. daily. Penicillin solution was then omitted between the hours of 12:00 midnight and 7:00 in the morning, 5-percent sulfathiazole ointment being used for the last dressing of the day.

Culture from the cul-de-sac showed no growth.

On February 2d, lessened ciliary con-

gestion and ocular tenderness were observed. The ulceration stained with fluorescein was one-half its original size and was located slightly eccentrically to the nasal side. A crescent-shaped, non-staining furrow remained at the 3-o'clock position within the opaque but not ulcerated area.

Local therapy was reduced to three-hour intervals during the day.

Five days later only a 2-mm.-diameter area took the stain. No synechiae were visible. The entire area of involvement appeared as a dense opaque area with the same clear periphery. Vision had improved to the perception of fingers at four feet.

The allotted penicillin was exhausted, but local sulfathiazole ointment was substituted. Oral sulfadiazine was continued. The blood sulfadiazine level on February 4th was: free = 2.3 mg. percent; total = 2.6 mg. percent. The blood Wassermann report was negative.

On February 10th, the lesion was completely healed with a resultant dense central corneal scar. The patient was discharged to the Out-Patient Department and advised to use White's ointment and to continue the application of warm compresses.

The patient was seen in the Out-Patient Department on February 14th, 21st, and on March 6th, and showed subsiding congestion and constant visual improvement. On March 6th, her vision O.D. was 10/200, and the eye was white and quiet. The pupil was active and without synechiae. Tension remained normal to palpation. By slitlamp, the corneal opacity was observed to involve the entire thickness of the substantia propria; it was covered by smooth epithelium. Peculiarly enough, the demarcation of the scar was equal to the extent of the corneal involvement at the height of the disease. It had a disciform appearance surrounded by clear

cornea; the density of the opacity varied in different areas. The nasal furrow persisted as part of the border of the scar. Several fine deposits remained upon the anterior capsule of the lens.

An ointment containing 2-percent yellow oxide of mercury was prescribed to be applied four times daily to stimulate resorption of the scar.

#### COMMENT

A case of ring abscess of the cornea has been presented wherein dramatic therapeutic results were obtained with the local extraocular and intraocular use of penicillin plus oral sulfadiazine. The cases of recovery of ring abscess which have been reported are few. No such case has come to the author's attention in which penicillin was employed as an intraocular instillation.

The use of a saturated solution of sulfanilamide (0.8 percent) as an injection into the anterior chamber has been reported in a case of purulent iridocyclitis.<sup>2</sup> This solution was tolerated well by the tissues but one could not predict the effect on the tissues of a solution of penicillin. "Penicillin"\* supplied as the sodium salt

of penicillin was dissolved in normal saline, from which a yellow-tinged solution (250 units per c.c.) was obtained. Approximately 0.3 c.c. ( $\pm 75$  units) was instilled. Local hourly irrigation was performed with the same solution. It was necessary to repeat the intraocular instillation 24 hours later. The astonishing subsidence of the process, disappearance of the hypopyon, and negative culture evidenced the therapeutic effect. The solution was well tolerated by the tissues; no synechiae have remained and the lens is clear. Only a deep scar of the cornea remains involving the tissue to the extent of the original lesion.

The organisms obtained were hemolytic *Staphylococcus aureus* from the anterior chamber and cul-de-sac, *B. pyocyaneus* from the cul-de-sac.

The effect of the sulfadiazine as against that of penicillin in this case cannot be debated. The aim was a therapeutic result and the gravity of the situation demanded that all agents at hand be used. One can conclude, however, that penicillin was well tolerated by the tissues in the concentration employed for intraocular instillation.

Iontophoresis has supplanted the need for intraocular injections in many instances. The fact that the apparatus, simple as it may be, is not possessed by all institutions, may necessitate anterior-chamber instillation of penicillin.

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## MYXOMA OF THE LOWER EYELID

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*Bethesda 14, Maryland*

Mixed tumors of the eyelid with the typical structure of the lacrimal gland are common, about 256 having been reported, but, in so far as it was possible to ascertain, no previous reports of a myxoma of the lower lid composed of the structure of a sweat gland have been made.

In the thirteenth annual report of the Memorial Ophthalmic Laboratory, Giza, Cairo, there is published a case of a mixed tumor of a sweat gland of the eyelid. It occurred just above the inner canthus of the left upper eyelid, and was about 2 cm. in diameter. It was encapsulated and was easily shelled out. Microscopically it had the typical appearance of a mixed-cell tumor of the salivary-gland type. The component cells were rounded, cubical, spindle shaped, and angular, arranged in islands and branching strands. Some groups of cells had a glandular arrangement. The stroma was loose and cellular and in many places there was evidence of mucin formation, giving rise to the appearances of mucoid or myxomatous connective tissue.

Mixed tumors may also develop in regions removed from lacrimal glands, salivary glands, and the like. They occur in the pharynx, on the lips, and other sites.

As to their origin, there are many opinions, which may be grouped into two theories: the one proposing a conjunctival origin, the other proposing an endothelial origin. Other authors attribute to these tumors a mixed ciliary epithelial origin.

Regarding pathogenesis, the majority of writers are in agreement in considering these tumors to be derived from disturb-

ances in development. Some believe that the tissue of the tumors is the result of a proliferation of the already developed glandular tissue; the glandular lobules change into new lobules whose septa of connective tissue are developed from previously existing septa. This accounts for the lobular structure of the tumor.

### CASE REPORT

A woman, aged 39 years, had noticed a small growth near the inner angle on the left lower lid for two months prior to consultation. Examination revealed a small mass surrounding the left lower punctum, elevated, and with a glassy cystic appearance. The punctum and canaliculus were patent. The tumor was not encapsulated and at the time it was dissected from the lid, it was difficult to determine the line of demarcation from the orbicularis muscle. The wound was closed with black-silk sutures and healing was uneventful.

**PATHOLOGIC REPORT** by Algernon B. Reese, M.D.: *Subject*, Myxoma of the eyelid; specimen from margin of the left lower lid. *Stains*: hematoxylin and eosin, trichrome, mucicarmine.

The specimen consists of two fragments of tissue both of which are covered on one side by a layer of stratified epithelium showing slight tendency toward keratinization along the surface. The nuclei of the basal layer are more darkly staining and cylindrical. The one piece consists almost entirely of tumor tissue extending from the corium into the deeper tissue, where it infiltrates between striated muscle fibers. The cells of this tumor are stellate and contain a nucleolus which varies a great deal in size and shape, stains lightly with hematoxylin, and has a diffuse almost homogeneous distribution of the chromatin. There is a scanty amount of faintly eosin-staining proto-

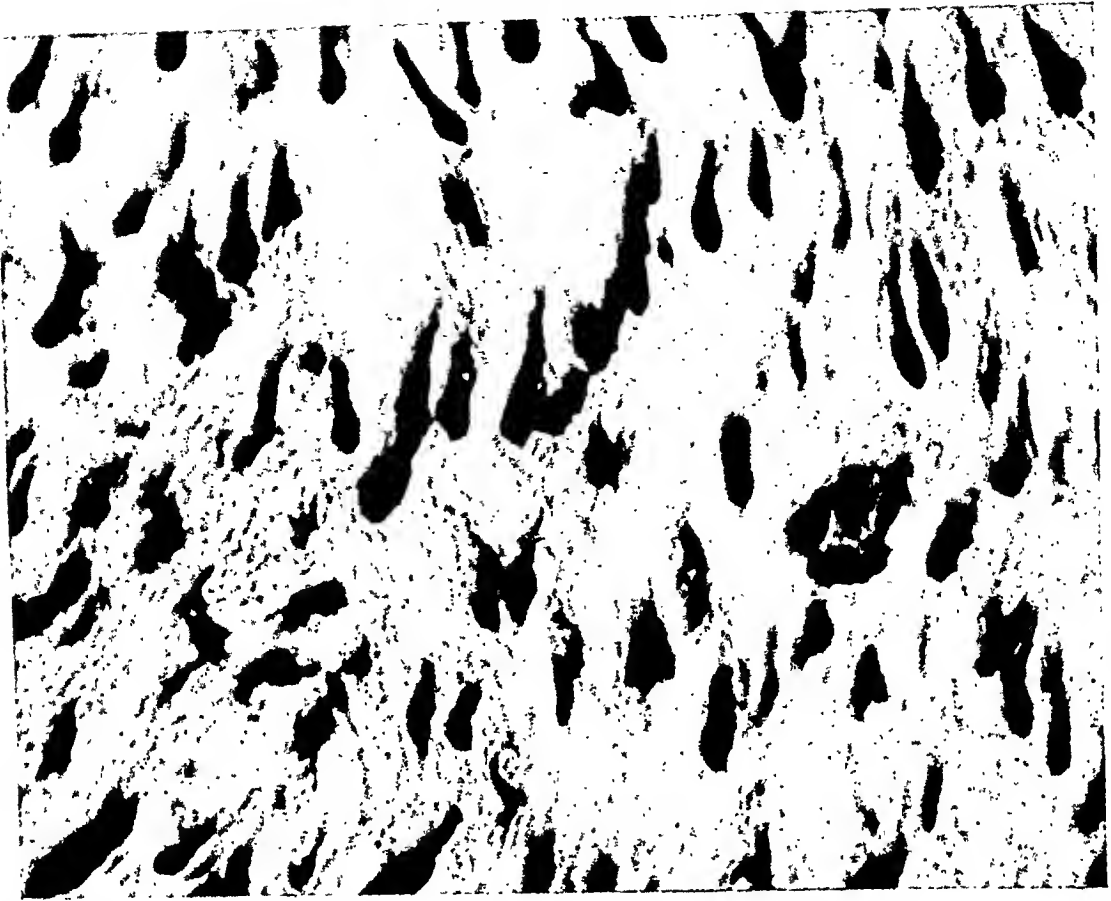


Fig. 1 (Town). Myxoma of the lower-lid margin ( $\times 350$ ).

plasm and a coarse, wavy fibroglia structure. The main characteristic of the tumor, though, is the intracellular substance, which stains faintly blue with hematoxylin, faintly pink with mucicarmine, and faintly red with trichrome. In places it is almost homogeneous but at most sites it contains a fine fibrillar structure. This intracellular substance seems to compress the nuclei and fibroglia. Immediately beneath the epithelium, the nuclear elements are much greater and the intracellular substance less, so that here the tissue more closely resembles the usual connective tissue. There is no tendency to encapsulation, but the tumor borders have rather poor demarcation due to its gradual infil-

tration into the surrounding structures.

The second piece of tissue is composed almost entirely of a normal-appearing connective tissue in which is striated muscle, a hair follicle, and some rudimentary glands that seem to resemble the sweat-gland type. Beneath the epithelium at one site is some tumor tissue which resembles that described in the first specimen.

*Diagnosis:* Tumor of lid—myxoma, probably derived from the intermuscular connective tissue.

Drs. A. Purdy Stout, Fred Stewart, and Hillman have examined this specimen and concur in the diagnosis.

*U. S. Naval Hospital.*

# SOCIETY PROCEEDINGS

EDITED BY DR. DONALD J. LYLE

## ROYAL SOCIETY OF MEDICINE

### SECTION OF OPHTHALMOLOGY

October 8, 1943

MR. FRANK A. JULER, *president*

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#### BURNS OF THE EYELIDS AND CONJUNCTIVA

SURGEON REAR ADMIRAL CECIL WAKELEY, in opening the discussion, said that the problem of burns of the face and eyelids has been a very important one during this war as well as the last war. In the last war, in the navy, there were over 6,000 cases of burns, 95 percent of which affected the face and hands. In the services, whether in the airplane, the tank, or the large or small ship, the face and hands suffer most severely. The first-aid dressing in those days was picric acid, but the cases showed that this was of no use whatever, because when put on and left there, it coagulated the skin to such an extent that a second-degree burn was converted into a third-degree burn when the dressings were removed.

In 1916 it was realized that there were two fundamental things in the treatment of burns: (1) elimination of sepsis; and (2) skin grafting for the third-degree or deep burn.

Soon after the beginning of this war there was an undue number of facial burns which were the result of the men having the face completely unprotected. At the end of 1939 extra protection was devised for men who did not wear a gas mask. It consisted of cellulose acetate goggles and aertex heat-resisting material

for the nose and mouth. This protective device markedly decreased the incidence of burns of the face. The greatest proportion of cases are produced by exploding bombs. The bomb may not have touched the patient at all, but the effect of the blast is to split the skin, and produce a superficial burn of the hair and face. There are usually other lesions as well. Patients have been successfully treated with triple-dye jelly.

In a bomb flash burn the blast may also cause the skin to split. Some of these lesions of the skin penetrate a quarter of an inch, but the face is so vascular that practically no scarring is experienced from the effect of such burns, and there is no permanent disability.

In the treatment of burns, there is a vast difference between the case which is brought to the hospital within an hour of the accident and the case which does not reach the hospital for five or six days. In the Royal Navy at the present time 50 percent of the casualties due to burns occur on smaller ships which have no medical officers on board and often cannot reach port for five or six days. In 1939-1940 one half of these patients died. By the time the men reached the hospital they were moribund. The use of tannic acid was abandoned and a coagulant such as the triple dye or gentian violet was used and the mortality rate was reduced to 5 percent.

At the beginning of the war it was thought that every case of burns should have intravenous plasma, or saline. At the present time only 1 out of 10 is given intravenous therapy and that is due to the fact that this method has been replaced by the intake of fluids by mouth.

*Shock.* He said that in the opinion of the Navy morphia will never kill a man who is in pain. As to the application of heat in shock it has been stated that the clinician is apt to overheat his patients who are suffering from shock. This may be true in some cases, but he said he has never seen a patient who was badly shocked suffer from too much heat. As soon as the patient's clinical condition has returned to normal the heat should be reduced.

Wing Commander J. C. Neely said that an analysis of 120 cases of burns received at an R.A.F. hospital showed that in 80 percent the face was affected, and, of this number, 20 percent had ectropion and 5 percent had the globe affected. The causes of these types of burns were: (1) petrol flames, incendiary and flash bombs; and (2) caustic acid, alkalis, and gaseous chemicals. The goggles which were first issued were inadequate because of their restricted visual fields. These have been modified according to the specifications of Air Commodore Livingston and now offer a very wide field of vision.

Flight Lieutenant D. C. Bodenham said that, as had been pointed out, in war burns of the face due to exposure to flame the eyelids were very frequently involved. He stressed the importance of the sebaceous glands and hair follicles of the skin, because in destructive burns there were invariably isolated epithelial cells left in the dermis and it was from these island cells, by spreading and coalescing, that healing occurred.

The two types of burns, important from the point of view of treatment, were the superficial second-degree burn affecting the epithelium only, and the destructive or third-degree burn in which all or practically all of the dermis was destroyed. But it was surprising how often epithelial glands survived and were suffi-

cient to bring about the healing of small areas, although in the case of extensive destruction this was much too slow, and skin grafting was necessary.

He showed a case of a typical second-degree burn, saying it would heal with very little trouble, almost without treatment, and would present practically no problem provided it was kept clean.

The real problem was the destructive third-degree burn, with the epithelium hanging in loose shreds, exposing the underlying dermis, which was coagulated. No treatment would entirely prevent scarring in these cases.

In facial burns, because of the very loose supporting tissues, a tremendous amount of edema developed even with a moderate burn. The edema appeared a few minutes after the accident and increased up to 12 hours. It remained at the maximum from 12 to 36 hours and then began to subside.

In the Air Force there were only a few flash burns. These burns were due to the instantaneous combustion of magnesium used in flash bombs. In these the exposure was a matter of a fraction of a second, whereas in the flame burn it was anything from 10 to 60 seconds, and permitted a chance to close the eyelids, which tended to save the globe at the expense of the lid. In the flash burn, although there was conjunctival involvement, the exposure was so brief that the burn was largely superficial. The globe in these cases was somewhat protected by the constant film of moisture which bathed the cornea and the conjunctiva.

In magnesium flash burns tattooing of the globe sometimes occurred, owing to minute particles being driven into the globe by the force of the explosion. Unfortunately they were often too small and too numerous to be removed surgically. Though the skin of the eyelid was particularly delicate, it was surprising how,



even in the worst burns of the eyelids, the tarsal plates remained intact.

*Treatment.* In the Royal Air Force the results with tannic acid were so unsuccessful that quite early in the war its use was forbidden. The present-day treatment rested on simple principles; namely, to prevent infection and to do as little harm as possible to the healing tissues. If infection developed it should be treated specifically. Early healing should be the aim and, if necessary, it should be assisted by skin grafting. For some 18 months, he said, they had been using the synthetic detergent, cetyl trimethyl ammonium bromide. It was used in 0.75-percent water solution and was a very good anti-septic. It combined many valuable features for the primary cleansing of fresh burns. It was applied with a swab of cotton-wool. Any loose-hanging threads of epithelium were removed. Cleansing was followed by an application of sulphonamide, either powder or 3-percent cream. The face was covered by coarse mesh vaseline gauze, and this made a very soft, gentle, nontraumatic dressing, and one which could be easily removed.

Facial burns were particularly open to infection. The nose and mouth could not be completely covered and formed an adjacent source of staphylococci and streptococci, which obtained easy access to the burned tissue; in this way infection, particularly staphylococcus, occurred almost always in the treatment of these severe burns. Penicillin had been used as a local application. If it was used in a cream base he said he preferred a simple mixture of lanette wax and vaseline. Penicillin, made to a strength of 100 units per gram, was consistently effective in eliminating streptococci and staphylococci from granulating surfaces. It was applied every 24 hours, and the cases as a rule responded within four days. In undertaking specific treatment, he said they often reverted to

penicillin because of the failure of the sulphonamides. In this way they obtained the conditions under which healing took place most rapidly.

Later when contracture of the lids developed, keratitis was not infrequent, and might result in ulceration with loss of the eye, though this had not occurred in his experience. In the milder cases simple measures might be employed, such as constantly keeping the globe moist with saline and using a lubricant like liquid paraffin. In the severe cases with complete ectropion which developed before the face and lids had healed, this alone would not prevent keratitis. A patient was shown wearing a contact lens.

Effective protection to the cornea could be given much more simply by wearing a standard anti-gas shield. These eye shields were particularly valuable in protecting the cornea when such cases came to operation for skin grafting of other areas.

They could be used with complete confidence and many sore eyes could be avoided by this simple measure.

Squadron Leader G. W. Cashell said that it was interesting to note that in the R.A.F. type of burns of the face it is unusual to find any burning of the cornea or conjunctiva. The lids, which were instinctively closed, bore the brunt of the trauma, and in the majority of cases there was only some slight reddening of the conjunctiva, and slight edema of the corneal epithelium.

Cases of direct burning of the conjunctiva have been due to: (1) a magnesium flash bomb; (2) incendiary bomb; (3) the effect of phosphorus; and (4) concentrated sulphuric acid.

In treating cases where the conjunctiva and cornea were directly involved, the important thing was the prevention of adhesions between these two structures, or between the palpebral and ocular con-

junctiva with obliteration of the fornix. It was much easier to prevent these complications than to deal with them.

He reported details of five cases. The points to be noted with regard to these special types of burns were: (1) control of infection; (2) prevention of symblepharon, which could be guaranteed by the use of a rapidly made plastic contact lens; and (3) mucous membrane could be used to restore the conjunctival fornix, where obliteration had occurred, and was less irritating than skin.

Mr. T. Pomfret Kilner confined his contribution to the showing of a film which indicated clearly the technique of eyelid grafting. This seemed all the more justifiable since a very high percentage of the repair work on burns about the eyelids is concerned with the treatment of ectropion.

He advised that when possible only one eyelid should be operated on at a time; that it was unwise to graft upper and lower eyelids at the same operation, for if this were attempted, it would be difficult to obtain over-correction, on which success so much depended. He said that approximation of eyelids by tarsorrhaphy and grafting both eyelids with a single mold-applied graft failed to give the necessary area of new skin, reëversion of the eyelid over the mold being essential.

He also stressed: (1) the importance of early grafting—even at the risk of re-contraction or partial failure—to provide covering for an exposed cornea and avoidance of ulceration and opacity formation; (2) the need to remember the bearing of other scarred areas of the face on the eyelids—release of scarring of the cheek or forehead regions often being needed to overcome drag on the eyelids; and (3) the importance of diagnosing the extent and type of loss.

Mr. Frederick Ridley spoke on the protection of the eye. His observations were

based upon the experience of a Maxillo-Facial Unit, where more than 100 cases of burns so severe as to require lid grafting had been treated. In summarizing, he stated that no coagulants should be used in the treatment of the eyelids; the splinting effect, the difficulty of proper care of the eye, the discomfort, and the fact that nothing is gained by waterproofing such a minute area are strong contraindications. Tulle gras dressings and saline packs are satisfactory. The full saline bath has a dramatic effect in alleviating blepharospasm and photophobia. Grafting of the lids should be undertaken as soon as lid retraction develops. The exposed cornea may be protected by contact lenses; delay in production, discontinuity of wearing, retention of pus, and discomfort are serious disadvantages. Lid suture is impracticable in the acute septic stage and useless in the cicatricial stage. Early cases with loss of lid tissue may be saved by sliding down a frontal skin flap and suturing over the exposed eye.

#### TWO CASES OF WHOLE-THICKNESS SKIN GRAFTS TO THE LOWER LID

MAJOR A. SEYMOUR PHILPS (for Sir Harold Gillies) presented two patients who had had whole-thickness skin grafts taken from behind the ear. Attention was drawn to the good color match of this skin with the surrounding area.

The first patient was badly burned about the face and hands, which resulted in marked scarring and ectropion of the lower lids of both eyes. He had both lower lids grafted in May, 1943, and a skin-grafting operation on his nose in August, 1943.

The second patient, although not injured by burning, had a marked degree of cicatricial ectropion of the right lower lid. This was grafted in August, 1943, and after two months the result appeared to be very satisfactory.

## METALLIC FOREIGN BODY IN THE VITREOUS

VIOLET M. ATTENBOROUGH (for Mr. T. C. Summers) presented the case of a 37-year-old riveter who was first seen in March, 1943. He gave a history of having received an injury to the right eye one year ago while riveting duralumin. Vision in the right eye was 6/9, in the left eye 6/6. A large foreign body could be seen projecting into the vitreous. This proved to be nonmagnetic. The eye was quiet. In September the patient complained that vision in his right eye was failing; it was reduced to 6/24. The vitreous was hazy and there were metallic deposits on the surface of and in the lens capsule. There was a greenish discoloration throughout the entire lens. The left eye was unaffected.

## NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

November 1, 1943

DR. SIGMUND AGATSTON, *chairman*

### TOPICAL DIAGNOSIS OF HOMONYMOUS HEMIANOPIA

DR. ALFRED KESTENBAUM subdivides, for diagnostic purposes, the optic pathway behind the chiasm into six sections: (I) optic tract; (II) external geniculate body; (III) anterior third of the optic radiation near the internal capsule; (IV) and (V) middle and posterior thirds of the radiation in the white substance of the temporal, parietal, and later occipital lobes; and (VI) visual cortex.

The following signs are looked for:

1. Wernicke's hemianopic pupil reaction indicates a lesion in section I but it appears very rarely.

2. Atrophy of the discs, more severe on the side of the hemianopia, develops in lesions of sections I and II, but not be-

fore several months and is, therefore, not available in recent cases.

3. Optokinetic-nystagmus test. Rotation of a striped drum normally causes nystagmus. In certain cases of homonymous hemianopia this nystagmus is absent or weaker on the side of the hemianopia. This sign is significant only if there is a definite, large difference in the nystagmus of the two sides. In 41 cases in which the site of the lesion was verified (autopsy, biopsy, and so forth) the sign was positive 22 times. The radiation was always involved, twice in the temporal lobe, 16 times in the parietal lobe, and 4 times in the temporo-occipital region; that is, always section IV or V. The sign was negative 19 times and in all but one the optic radiation was not involved. Disturbance of optokinetic nystagmus on the side of the hemianopia indicates, therefore, section IV or V.

4. In certain cases of homonymous hemianopia, the eyes follow a moving object with a normal smooth movement to all sides except the one *opposite* to the hemianopia. Here the movement is made up of a series of jerks or cogwheel movements. Among 33 cases this sign was found 9 times, in all of which the parietal lobe was involved. The sign, therefore, indicates section IV.

5. In homonymous hemianopia the visual fields are sometimes very incongruent apart from the temporal crescent. Only definite incongruence can be regarded as significant. In 31 cases it was found 10 times. The lesion involved the optic tract and central ganglia 4 times, and the visual cortex 5 times. Incongruity, therefore, indicates a focus in sections I, II, or VI, the optic radiations not being involved.

6. Macular sparing of less than 3 degrees was found occasionally in any location. Macular sparing of more than 3 degrees was present in 6 of 26 cases. In

all the focus was in the occipital lobe or cortex, that is, section V or VI.

The presence or absence of these six signs allows localization of the seat of the lesion by purely ophthalmologic tests.

*Discussion.* Inquiry as to the significance of the Behr pupil was made. It was pointed out that a brain tumor is a complicated structure, not naturally circular and with swelling and disturbed circulation about it, all of which may make clinical diagnosis unreliable and calling for encephalography and ventriculography.

Dr. Kestenbaum stated that Behr's sign, a wider pupil on the side of the homonymous hemianopia, is infrequent. The schematic system he presented is an indication of the localization, the final diagnosis is up to the neurologist.

#### UNUSUAL NEURO-OPHTHALMOLOGIC CASE PRESENTATIONS

DR. PHILIP S. GOODHART presented and fully explained a motion-picture film, demonstrating unusual ophthalmologic conditions with pathologic changes in the central nervous system.

A *Marcus-Gunn phenomenon* was demonstrated in a girl, aged 13 years. She showed abnormal associated movements of the right upper lid synchronous with movements of the lower jaw.

*Skew deviation.* A nine-year-old boy was shown; he was later operated on and a large cerebellar neoplasm was removed. The patient was shown previous to operation and the skew deviation demonstrated; upon outer gaze the homolateral eye turned downward and outward, the other eye upward and inward. Skew deviation was due to brain-stem lesion.

*Types of nystagmus.* Three patients with multiple sclerosis demonstrating different types of nystagmus were shown. The pathology was doubtless in nerve fibers or centers of association between

the longitudinal fasciculus and respective centers controlling eye movements.

*Weber's syndrome.* A man, aged 50 years, was presented. He had paralysis of the third cranial nerve with contralateral hemiplegia; vascular lesion of the basis pedunculi.

*Duane syndrome.* Two patients were shown in which unilateral and bilateral Duane syndrome, respectively, were demonstrated. Both were neurologic cases and the finding of the Duane syndrome was incidental, the latter due to fibrosis of the levator oculi superioris and of the external rectus. As a result there is widening of the palpebral fissure as the eye turns outward and narrowing as it turns inward; there is also limitation of external gaze in the affected eye.

*Postencephalitis syndrome.* There is inability to open voluntarily the closed eyes without throwing the head far backward.

Congenital absence of posterior orbital wall with resulting pulsating exophthalmos in a case of von Recklinghausen's neurofibromatosis was demonstrated.

Pathologic specimens were also presented.

#### OCULAR FINDINGS IN 1,200 CASES OF HEAD INJURY

DR. NATHAN SAVITSKY personally studied 1,200 cases over a period of 13 years. All the injured were studied three weeks or later after the initial trauma. No acute cases were included in this series.

He encountered 112 organic ocular findings attributable to the head trauma in 109 different patients. The commonest finding was discomfort with conjugate gaze which was seen in 56 patients (4.6 percent). Control studies of the incidence of discomfort with conjugate gaze have been completed with Dr. M. Madonick. Such discomfort was found in only 1 of 2,000 cases diagnosed as psychoneuroses

and in 4 of 10,000 draftees. The other organic ocular findings were:

1. Unilateral optic atrophy—2 cases.
2. Divergence paralysis—5 cases.
3. Isolated ocular palsies—9 cases; of these 5 involved the superior rectus and 3 had ptosis.
4. Bilateral sixth-nerve palsy—2 cases.
5. Pupillary changes were noted in 11 cases as follows: unilateral dilation—7; bilateral dilation—2; paradoxical pupil—1; and irregular fixed pupils—1.
6. Enophthalmos—2 cases.
7. Limitation of upward gaze—1 case.
8. Visual-field disturbance—8 cases; of these 6 were homonymous hemianopia, 1 was a ring scotoma, and 1 central scotoma.
9. Bilateral papilledema—2 cases.
10. Nystagmus—3 cases; 2 rotary and 1 lateral.
11. Alexia—1 case.

Attention was called especially to the frequency of divergence paralysis due to an injury to an hypothetical divergence center in the brain stem. Nystagmus is a rare sequel to head injury, and its presence should make one particularly careful about ruling out concomitant disease. In 12 of the isolated ocular palsies there was no evidence of injury to the orbit or eye. Indirect traumatic palsies of the ocular muscles can take place. In neither case of optic atrophy was there direct injury to the eye or orbit.

In 15 cases in this series the ocular findings were due to diseases unrelated to the trauma. Careful neurologic examination and accurate anamneses are extremely important. In 6 of these cases there was optic atrophy unrelated to the trauma. In 218 cases (16 percent) there was undoubted evidence of functional superimposition in the nature of conversion hysteria. Of these 186 had a function hemisensory syndrome with blurred vision or diminished perception of bright-

ness on the same side. Contraction of the visual field on that side was inconstant. In addition there were 2 cases with markedly contracted fields, 3 with monocular diplopia, and 1 case of spasm of convergence.

The most common subjective complaints were transitory obscuration of vision with change of position, blurring of the printed page after reading for a short period of time, and spots before the eyes. Sensations of heaviness, tightness, and burning in the eyes were frequently reported in these cases, especially in those who showed other evidence of psychogenic superimposition.

*Discussion.* Dr. A. Kestenbaum agreed with Dr. Savitsky regarding hysteria and cited a case of encephalitis simulating hysteria; the patient had retinospasm every Monday, Wednesday, and Friday.

Dr. M. Davidson said he has frequently found miosis on the side of scalp laceration in cases of head injury. Optic atrophy, appearing after head injury, when it had not been noted on examination in the hospital for the head injury, must be assumed not to have been present before. He was not convinced that divergence paralysis, seen a few times, was organic in nature. Early presbyopia is of frequent occurrence, and glasses are immediately recommended. Opticochiasmatic arachnoiditis, often not properly diagnosed preoperatively, is being discovered at operation following head injury.

Dr. Savitsky, in conclusion, pointed out that his series included the most severe as well as mild cases of head injury and that the severity made no difference in the optic sequelae as far as he could see. He has seen cases of optic neuritis—that is, inflammation of the nerve head—following concussion. There is such a thing as traumatic hydroencephalitis with papilledema. He has not found anisocoria with scalp lacerations following

head injuries although he has looked for it.

Leon H. Ehrlich,  
Secretary.

## CHICAGO OPHTHALMOLOGICAL SOCIETY

November 15, 1943

DR. VERNON M. LEECH, *president*

(Presented by the Department of  
Ophthalmology, University of  
Chicago)

### CHRONIC NONINFLAMMATORY GLAUCOMA

DR. THOMAS D. ALLEN, C. O. P., a man, aged 62 years, was first seen 16 years ago with Dr. Wilder. At that time the vision was R.E. 20/40, corrected to 20/30+; L.E. 20/30+, corrected to 20/20+. The pupil of the right eye measured 4 mm. and the left 3 mm. No medication had been used for several days. The tension was R.E. 60 mm. Hg, L.E. 27 mm. Hg (Schiötz). The optic disc of the right eye was sharply outlined and glaucomatous cupping, 4 diopters deep, extended to the periphery. The vessels bent sharply at the disc margin and there was a glaucomatous halo. The optic disc of the left eye had a large physiologic cup which sloped temporally and extended nearly to the disc edge. The visual field of the right eye was considerably contracted and indented almost like a swastika; that of the left eye was fairly good.

The patient was advised to use 1-per-cent pilocarpine six times a day and to adopt general hygienic measures. He was seen at intervals, and finally a trephining operation was performed on the right eye on January 30, 1928. No surgical difficulties were encountered, but atropine

was instilled in both eyes on the first postoperative day. This caused the tension to rise to 60 mm. in the left eye, but it was reduced to 20 mm. by immediate and vigorous measures. Postoperative vision with correction was R.E. 20/20-; L.E. 20/15. The tension, R.E., varied between 10 and 22 mm., an average of about 15 mm. The central vision gradually decreased and the visual fields contracted. Then, in 1941, a secondary infection robbed the patient of all vision in this eye. This infection was conjunctivitis, corneal ulcer, and endophthalmitis which was not controlled by four weeks' treatment with small doses of sulfanilamide. Cure was effected, however, in two or three days, when the dosage of sulfanilamide was greatly increased. Hemolytic *Staphylococcus albus* was cultured from the ulcer. The tension, R.E., which was high at the time of the infection, subsided to normal. Since that time there have been no further complications.

The tension of the left eye remained low on miotics for over two years. In July, 1930, the use of pilocarpine had been stopped for 24 hours, the tension was found to be 66 mm., although the vision and fields were good. An iridencleisis was performed under a thick conjunctival flap, the pupillary edge being cut and the iris tucked in the corner of an oblique conjunctival-limbus incision. The patient recovered very quickly from the operation. The tension since that time has never risen above 20 mm. and has usually been 10 or 12 mm. Vision with correction, more than 13 years after operation, is 20/20+. The visual field has remained normal.

This case was shown as an illustration of iris-inclusion operations. There remained at this time a very circumscribed, somewhat glassy bleb over the trephined area of the right eye and slight conjunctival edema in the left eye. The trephining

was done comparatively later in the course of the disease than was the iridencleisis. It might be unfair to conclude that the iris-inclusion operation is better than the trephining from this one case; one might get the impression, however, that the inclusion operation is less hazardous than the trephining.

#### MELANOSIS

DR. THOMAS D. ALLEN presented L. B. C., a woman, aged 64 years, who was first seen with Dr. Wilder nearly 24 years ago. At that time she had a rather darkly pigmented superficial lesion at the nasal side of the right eyeball, about 12 by 12 mm., extending about 2 mm. onto the cornea. This had grown from a small spot first noticed when she was four years old. During the year 1919 it began to show some activity. After several consultations she was given 45 radium treatments of 50 to 100 mg. each, because she refused to have the eye removed. At the end of 15 months the growth seemed to have almost entirely disappeared. Several months later it began to spread again in the upper and lower fornices. After a course of 40 more radium treatments it became apparent that the growth was progressing.

Dr. William Brown then gave nine treatments with heavy doses of radium, a total of 110 mg. As a result the lesion completely disappeared in about 6 months and had not reappeared after 21 years. The patient had no cataract, although there was a very slight peripheral cortical change in each lens. Vision in each eye was 20/20+ with correction. The patient was in excellent health.

This case, which was reported by Dr. Wilder in 1923, before the American Ophthalmological Society, was shown to call attention to the following facts: (1) The lens had not suffered; (2) the patient remained well and had normal vi-

sion; and (3) there was no recurrence of the tumor.

#### BILATERAL NERVE ATROPHY AND NYSTAGMUS

DR. R. J. MADI. A. C., a girl, aged 16 years, was first seen in the eye clinic at Central Free Dispensary in June, 1938. The parents stated that oscillating movements of each eye were first noted when she was six years old and that her vision seemed poor.

On examination the vision, R.E., was 0.2-1; L.E., 0.1. A horizontal jerky nystagmus of varying amplitude was present, increasing in lateral gaze to the right or left. The palpebral conjunctiva of each eye was mildly injected. The extraocular muscles, tactile tension, lids, cornea, and anterior chamber were normal in each eye. The irides were light blue. The media were clear. The disc of the left eye was a marked typus inversus with a narrow inferior conus; that of the right eye was a moderate typus inversus. Each disc showed a grayish pallor.

She had been refracted each year and the best vision obtainable with correction was 0.4-1 in each eye. She progressed satisfactorily in sight-saving classes.

#### BILATERAL POSTTRAUMATIC OPTIC-NERVE ATROPHY

DR. CHARLES A. LEARSY. The patient, a 35-year-old man, was first seen at Central Free Dispensary of Presbyterian Hospital on October 18, 1943. He had had a head injury on February 10, 1943, and was unconscious for about two weeks. The right eye was blind on discharge from the hospital. Since June, 1943, some vision gradually returned. At first examination vision, R.E., was 4/200; L.E., 0.8-2. Each disc, particularly that of the right eye, was pale with fairly definite borders but there was some connective tissue in the central ex-

cavation and white connective-tissue sheathing on the central vessels. The peripheral field of the right eye was reduced to a wedge-shaped area in the inferonasal quadrant; that of the left eye showed only slight temporal constriction.

X-ray examination on October 14, 1943, showed an "old fracture through the roof of the right orbit, with slight separation of fragments." The optic atrophy was considered probably secondary to an initial papilledema which followed increased intracranial pressure and some additional direct involvement of the right optic nerve.

#### FIBROPLASIA OF RETINA

DR. R. C. GAMBLE, J. D., a six-year-old girl, was first seen at Children's Memorial Hospital five years ago. She was born prematurely, her birth weight being 25 ounces. The right eye was small, the anterior chamber shallow, and the pupil small. The lens was clear but behind it was a gray mass. No red reflex was obtained. The left eye was similar to the right except that the membrane behind the lens was on the nasal side only. A red reflex could be seen on the temporal side and in this area an arborizing group of blood vessels could be seen. A cataract then formed in this eye so that the membrane and vessels could not be seen.

This bilateral type of retinal fibroplasia is found in premature children. There is a unilateral type of persistent posterior fibrovascular sheath which is found in children born at term.

#### BILATERAL RETINOBLASTOMA

DR. ARTHUR J. STRICH. The patient, a 2½-year-old girl was admitted to Children's Memorial Hospital because of what appeared to be a severe inflammatory condition of the right eye, blepharospasm, lacrimation, and pain. The cornea was yellow and opaque. The tension ap-

peared to be normal. The fundus of the left eye, well seen through the clear media, was dominated by large gray choroidal patches traversed by undisturbed retinal blood vessels. A diagnosis of endophthalmitis in the right eye and exudative choroiditis in the left eye appeared rational except for the clearness of the media of the left eye. As the lesions of the choroid of the left eye gained thickness and the discomfort caused by the right eye did not subside, the latter was enucleated. A retinoblastoma with an unusual amount of calcification was found. To this Dr. Gamble attributed the inflammatory character of the pathologic condition, as the areas of calcification were imbedded in large leukocytic infiltrates. The child received radiation therapy.

#### TWO CASES OF ENDOPHTHALMIA

DR. ARTHUR J. STRICH. Each of two babies had had an endophthalmitis in recent months, and each received energetic atropinization and sulfa therapy.

The first case followed a pustular dermatitis. Culture from the skin lesions revealed *Staphylococcus aureus* and *albus*. Treatment was started the sixth day after the eye became red. The outcome was retinal detachment and atrophía bulbi.

In the second case the endophthalmitis developed in the course of a meningococcal meningitis; treatment was started on the third day after the eye became red. A slight discoloration of the iris and a few spots on the anterior surface of the lens were the only remaining findings.

#### TAPETO-RETINAL DEGENERATION

DR. ARTHUR J. STRICH. The patient, a two-year-old boy, was brought to the Children's Memorial Hospital four months ago because of poor vision and nystagmus. He was typical of a small group of children with these symptoms,



who were under observation. The ophthalmoscopic findings showed a pigmentary change, a large central area of very fine depigmentation and dustlike pigmentation. The discs were pale, and the blood vessels very thin. The macular regions and the periphery did not show anything of significance. There seemed to be some mental retardation. The only significant finding in the family history so far was that the mother had what was termed a "menopausal psychosis."

This was not the ordinary form of retinitis pigmentosa, in which the changes are in the periphery and not in the central region. It was not so-called central pigmentary degeneration because there the pigment, according to Duke-Elder, appears as "either spiderlike clumps or scattered black dots forming an island around the macula," whereas in these cases the pigment appeared as an extremely fine dust. It was not the infantile form of amaurotic familial idiocy in which, according to Spielmeyer and Vogt, the pigmentation appears as a well-defined patch in the macula. It may be that this form represents a distinct form of what Leber termed "tapeto-retinal degeneration."

#### DISSEMINATED CHORIORETINITIS, RIGHT EYE

DR. JUSTIN M. DONEGAN. A woman, aged 38 years, was first seen in the Central Free Dispensary on November 4, 1943. Three months previously vision in the right eye failed overnight to the degree that she could not distinguish faces at 10 feet. There was no associated pain nor were there inflammatory symptoms. The vision of the left eye had always been poor. The patient was under treatment in another clinic for congenital syphilis.

Examination showed that the corrected vision was R.E. 0.4+1; L.E. 6/200. The ocular media were clear; the disc in the

right eye was normal; that of the left eye was a *typus inversus*. Just temporal to the fovea of the right eye was a slightly raised greenish-black pigmented mound, 1 P.D. in size, and near its nasal edge was a small bright dot of hemorrhage. The macular region of the left eye showed a black-and-white roughly horizontal oval area of old healed chorioretinitis measuring 2.5 by 1.5 P.D. Immediately adjacent to the fixation point nasally in each central field was a roughly oval scotoma of 7 by 5 degrees as determined by visual-field studies of the right eye, and 10 by 8 degrees in the left field. The blind spot shown by the left eye was irregularly enlarged to four times its normal size, and the peripheral field of the left eye presented a generalized constriction.

#### CYANOSIS OF THE RETINA

DR. ROY O. RISER. S. X., a nine-year-old boy, had been under observation for several years at Children's Memorial Hospital because of a probably congenital heart disease with a compensatory polycythemia. He did, however, present some findings of polycythemia vera, according to the department of hematology. He had the clubbed fingers characteristic of a congenital heart disease. The blood showed 7,030,000 erythrocytes per cubic mm. and 115 percent hemoglobin determination. Cyanosis of the face, lips, hands, and so forth, accompanied the flushing of the bulbar conjunctiva, and the typical retinal picture of very large dark veins, enlarged arteries of slightly lighter hue, and flushing of the discs and retina generally. Kodachrome fundus photographs accompanied the presentation.

#### CORNEAL LEUKOMA—CONGENITAL PERSISTENT PUPILLARY MEMBRANE

DR. ROY O. RISER. J. L., a five-year-old Nègro boy, had red eyes when two

months old, the left worse than the right. He had received treatment for one month in the rural part of Arkansas.

The right eye was normal. The patient had a convergent strabismus of the left eye of 40 degrees. There was a central dense deep corneal leukoma, 2.5 mm. in diameter, obscuring a golden-brown plaque, 2 mm. in diameter in the pupil. Running from this plaque to the collar-ette of the iris at the 2-o'clock and the 10-o'clock positions were golden-brown threads. A red reflex was barely discernible in the left eye.

Kahn and tuberculin tests gave negative results. Physical findings were normal. The slitlamp examination showed no signs of old interstitial keratitis. In addition to the aforescribed pathologic changes the patient had an amblyopia. No treatment was advised.

#### SCIENTIFIC PROGRAM

##### HISTORY AND DEVELOPMENT OF THE IRIS- INCLUSION OPERATIONS

DR. THOMAS D. ALLEN presented a paper on this subject which has been published in this Journal (September, 1944).

*Discussion.* Dr. Sanford Gifford said that he had performed the operation frequently since 1927, when he reported a series of cases before the American Academy of Ophthalmology and Otolaryngology, and believes it to be one of the two most valuable procedures at their disposal in chronic simple glaucoma. The other procedures to be compared with it are, of course, Elliot's corneoscleral trephining and the sclerecto-iridectomy of Lagrange. In this hierarchy he felt inclined to place trephining first, iridencleisis second, and sclerecto-iridectomy third, although he recognized that many good surgeons, especially in France, prefer the last named and obtain results with it comparable to those with trephining.

A comparison of trephining and iridencleisis might be made as follows:

*Advantages of trephining:* (1) Great effectiveness in reducing tension, especially in the higher brackets, (2) round central pupil, and (3) little need for after care except the use of a mild antiseptic for life.

*Disadvantages of trephining:* (1) Greater technical skill and experience required. (2) More danger of certain complications, such as (a) wounding the lens capsule; (b) late infection; (c) prolonged hypotony; and (d) loss of central field.

*Advantages of iridencleisis:* (1) Simplicity of execution; it is undoubtedly the easiest effective filtering operation for the surgeon of moderate experience. (2) Less danger of complications: (a) wounding the lens capsule is exceedingly rare; (b) late infections are exceedingly rare; (c) prolonged hypotony is rare, the chamber being filled usually after 48 hours; (d) probably because of this fact, loss of the central field is rare. (3) Iridencleisis is generally effective in reducing tension to normal limits.

*Disadvantages of iridencleisis:* (1) It is probably less effective in reducing tension in the higher brackets. (2) Hence, more after care is required, including miotics and massage in some cases and occasionally a secondary operation. (3) The pupil is not round and may be slightly high. A really high pupil should never occur if Holth's simple technique is carefully followed, whereas it always occurs following the iridotaxis of Borthen.

From this outline may be deduced the reasons for a set of indications for the two operations which have been gradually reached. As indications for trephining he said he considers the following conditions:

1. Cases of chronic simple glaucoma in which the tension cannot be reduced be-

low 40 mm. Hg (Schiötz) by miotics, provided the field is not cut down close to the fixation point.

2. Cases of very low-tension glaucoma in which the field is being lost while tension is seldom above 25 mm. Hg (Schiötz). This seems like a paradox, yet he said he believes that it is rational here to perform an operation which will reduce tension to the lowest degree possible.

As indications for iridencleisis the following conditions are usually considered valid:

1. Cases of chronic simple glaucoma in which the tension can be kept between 25 and 44 mm. Hg (Schiötz) by miotics.

2. Cases in which the tension is higher, but the field is cut down close to the fixation point.

3. Cases of hydrophthalmos. His preference for iridencleisis in this condition has come from a series of favorable results when the operation was performed early, and is supported by reports of cases in which trephining allowed the greatly stretched zonula to rupture during trephining, allowing fluid vitreous to escape and resulting in phthisis bulbi. He said that so far as he knew this has never occurred after iridencleisis.

As to technique, he believed the best procedure to be the simple iridencleisis of Holth, in which one meridional cut is made through the iris sphincter and the portion of iris next to this cut is turned out through the scleral incision and left beneath the flap. He said that everyone likes to make modifications in procedure, but the only ones he advocates in this operation are the use of the Foster Moore so-called water-tight suture and fixation forceps on the superior rectus. After injection of 4-percent novocaine, H. Gifford's forceps are placed on the superior rectus tendon through the intact conjunctiva as far back as possible, so as to give room for a very large conjunctival

flap. A straight horizontal cut is made in the conjunctiva just in front of the forceps, long enough to extend past the limbus on each side. Dissection of the flap is made close to the sclera, but not so close as to wound the scleral vessels. It extends just to the limbus and is undermined to expose the whole upper limbus. While an assistant holds the flap down, a very sharp keratome is inserted 1 mm. from the limbus far enough to make an incision 5 mm. long. The surgeon holds the fixation forceps and cuts with the keratome directly against his fixation. The point of the keratome is raised as it is withdrawn and the iris usually follows it into the wound. It is grasped with iris forceps and withdrawn far enough so that the sphincter border is visible. This is cut with iris scissors and the portion held in the iris forceps is turned out under the flap with the pigmented side upward. It is not manipulated at all except for this maneuver. A few pats with a spatula on the cornea usually suffices to replace the remaining iris pillar and it is seldom necessary to introduce the spatula into the anterior chamber. A running conjunctival suture is then used to close the conjunctival incision with about 8 to 10 bites, enough to close the incision tightly, leaving an untied portion of suture at each end. Then, and not until then, is the fixation forceps released.

The suture is removed, after six days, from both ends, after one of the loops near the middle has been cut. Use of the water-tight suture seems to favor early refilling of the anterior chamber and early development of a filtering bleb. In the first 21 cases which, he said, he reported, there were no cases of delayed filling of the anterior chamber. There have been a few since that time, among several hundred operations, but they are certainly more rare than after trephining or after iridencleisis without the suture. This su-

ture was designed for use in corneoscleral trephining and is equally useful in that operation. The same may be said of fixation on the superior rectus, which ensures a large flap, perfect control of the eye during operation, and an opportunity for accurate closure of the conjunctival incision.

Robert Von der Heydt.

## COLLEGE OF PHYSICIANS OF PHILADELPHIA

SECTION ON OPHTHALMOLOGY

November 18, 1943

DR. ALFRED COWAN, *chairman*

### DIABETIC CATARACT

DR. GEORGE J. DUBLIN, by invitation, stated that diabetic cataract is a distinct clinical entity. Rollo is the first to be credited with speaking of cataract as a complication of diabetes. Generally speaking, it is subdivided into two types. The first type of the so-called diabetic cataract is found in the adult in association with diabetes mellitus. This type of cataract is a common finding, and is observed repeatedly in association with diabetes. It is similar in appearance to the senile cataract including the cuneiform, saucer-shaped, and nuclear types. Actually there is no differentiation, and it is impossible by any known method of observation to tell them apart, even by slitlamp microscopy. In both the senile cataract and the type of lens opacity found in the adult with diabetes, slitlamp microscopy reveals vacuoles, fluid clefts, and lamellar separation in the cortex together with various opacities in the lens. Gradle, in a series of 76 cases of diabetes, found lens changes in 41, with a blood sugar averaging 298.7 mg. per 100 c.c. of blood.

The second type of lens opacity is found in the diabetic under 35 years of age. This is the true diabetic cataract and it is this type that is referred to under the classification of diabetic cataract. It has been considered a rare condition. O'Brien, Mullsbury, and Allen reported a series of diabetic cataracts in patients under 35 years of age amounting to 16 percent. In 1942 O'Brien and Allen reported another series of cases in which they found 36 patients with cataracts out of a number of 260 cases under 21 years of age (13.8 percent). True diabetic cataract may assume one of the following pictures, but they all have the same characteristic in that the opacities are all subcapsular in location immediately adjacent to the subcapsular line. The common picture is the snow-flake type of O'Brien, subcapsular in location, whitish in color, and irregular in form and size and truly resembling snow flakes. The second type is the arrangement of the opacities as irregular large and small plaques together with fine dust-like opacities having a dirty-brown color, subcapsular in location, and strongly resembling the senile cuneiform type of cataract. The third type is the bluish-white opacity in which the lens may become completely opaque and swollen in one to three weeks (hydrops capsulae lentis). This is the malignant form of diabetic cataract. According to O'Brien and Allen lens opacities in young diabetics occur invariably in those whose diabetes has been poorly controlled or uncontrolled for several months. After standardization of the diabetes, these opacities may progress slightly but after six months of control the lens opacities generally remain stationary.

He presented the case of Mrs. M. R., a 22-year-old white woman. She was admitted to the Metabolic Department of Philadelphia General Hospital. She had

had diabetes for 10 years. She developed a sore throat six days prior to admission. A diagnosis of cervical adenitis and acute bronchitis was made. The main pertinent finding was that the blood sugar ranged from 245 mg. to 356 mg. per 100 c.c. of blood on the day of admission.

She had been receiving 60 units of insulin for an uncontrolled and unstabilized diabetes. Routine examination of the eyes was negative externally; eyegrounds were normal. Both lenses showed irregular dirty-brown opacities as large and small plaques involving the anterior and posterior subcapsular zones in both eyes. Some of these opacities were pointed, resembling the cuneiform type of senile cataract. There was a small clear area of cortex between the opacity and the subcapsular line. The remaining lens was entirely clear. The vision was 6/60 in each eye, corrected with glasses to 6/12 in each eye.

*Discussion.* Dr. Alfred Cowan said that O'Brien and his associates divide what they call diabetic cataract into two groups. The type that Dr. Dublin reported is in the group that includes those that resemble the senile disciform cataract. At first the opacity in this case would appear to be just in front of the posterior capsule, but with the narrow beam of the slitlamp it is seen to lie just behind the face of the adult nucleus, leaving a narrow space behind the posterior capsule. The space is so narrow, because at the age of this patient, 22 years, the cortex is very small. Usually opacities in the lens occur in the youngest zone, but they lie deep, down to the last surface of discontinuity.

In the case reported by Dr. Dublin, the opacity was disciform, yellowish gray, and similar in every respect to the ordinary senile type.

Dr. James S. Shipman said that in his experience diabetic cataract had been

very rare. A patient under his observation for the past 15 years finally went blind, not from cataracts, but from diabetic retinopathy which was first to appear in his case and was quite gradual but definite. At present he is blind from the retinopathy, cataracts, and secondary glaucoma superimposed. So, diabetes does take its toll, and cataract is a definite complication. He said he believed that the criteria given by Dr. Dublin are as good as any; namely, the age of the patient, the history of diabetes in the presence of a high blood sugar, and the position of the opacities outside the embryonic nucleus.

Dr. H. Maxwell Langdon said he thought that Dr. Dublin was accurate in saying that it is difficult to tell diabetic cataracts from lens changes due to other causes. If the patient has a cataract and a high blood sugar with a spill-over into the urine, it is probable that the cataract is diabetic in origin; but it is doubtful whether in all such cases the cause of the cataract is the diabetes.

Many cataracts in young people remain unexplained. He said he had two such cases. The first patient was a 26-year-old woman with bilateral cataracts, who has been under observation for over five years. She had a careful physical examination with special reference to metabolic tests, and it was found that she had definite signs of hyperthyroidism. The thyroid was then operated upon. He said he thought that possibly some interference with the parathyroid caused the lenticular changes. There were no signs of diabetic changes whatsoever. The cataracts gradually advanced, and the vision of one eye was reduced to 2/60, so that the patient will undoubtedly require operation.

The second patient, a 37-year-old man, suddenly discovered that the vision of one eye was very defective. He was seen

the following day and the vision of this eye was limited to light perception. Examination revealed a practically mature cataract. The other eye was normal in all respects. He had been examined one year ago and his eyes were normal. A careful physical examination showed nothing to indicate such a condition. If either of these patients had diabetes, undoubtedly it would have been said that these were diabetic cataracts.

There are many elderly people who have ordinary senile changes in the lens, who also have an increase in the blood sugar and some sugar in the urine. These cases are usually classed as diabetic cataracts, and they may be; but it seems open to question whether or not the condition should be called diabetic cataract in a person with diabetes.

He said that he thought in the case presented by Dr. Dublin the cataract undoubtedly is due to the diabetic condition.

Dr. I. S. Tassman said that it seems there are other factors involved in the occurrence of cataract among these patients. The blood-sugar concentration, at any one time, in patients with diabetes is probably not the determining factor in the production of cataracts. Some diabetics have a high blood sugar and no cataract nor retinopathy. In others with a comparatively low blood sugar, cataract may be found alone or in association with retinopathy. These metabolic disturbances do not affect all patients in the same way. When a young patient with diabetes develops cataract, he said that he thought it should be called a diabetic cataract. However, there are certain unknown factors present, in addition to the blood sugar concentration, which are probably causative factors in the production of the ocular condition in these cases.

Dr. Solomon S. Brav said that he had

seen in consultation with his son, a 14-year-old child who had diabetes. There were no signs of retinal pathology or diabetic retinopathy, but the vision was reduced to 2/200 because of the lens opacities. It was questionable whether or not the condition was congenital or diabetic. The child was operated on about one year later. The cataract in each eye was extracted and the resultant vision was 20/30 in each eye.

Dr. George Dublin, in closing, said that diabetic cataract in the young person should not present too great a problem in differentiating it from a congenital cataract. The various layers of the lens develop at certain periods of life, and congenital opacities of these layers have a typical location and appearance. For instance, if a congenital opacity is limited to the embryonal layer, it is evident that the opacity occurred at some time in the first three months of uterine life. If the opacity is in the fetal nucleus, it occurred between the third and eighth month of fetal life; and if it was in the infantile nucleus, then it probably occurred the first month after birth. The adult nucleus is developed about the age of 10 years and upwards, so, an opacity of that zone would indicate involvement at the age of puberty.

Congenital cataract, unless it is completely opaque with obliteration of all layers of the lens, would be comparatively easy to diagnose. The history of diabetes, and its rapid onset would be a big help in differentiation. It was mentioned before that there is a malignant type of diabetic cataract called "hydrops capsulae lentis." This is the bluish-white cataract that is present together with marked edema. He stated that this is, in his opinion, about the only type that might be confused with a total congenital cataract. The other types of diabetic cataracts progress slowly and do not mature with-

in several weeks, as has been stated at times.

In the case presented here the cataract had been present for about one year. A previous eye examination two years ago failed to reveal any lens opacity. O'Brien and Allen have brought out some interesting facts and figures. They claim that diabetics who have not been standardized are the ones that develop these cataracts. O'Brien states that if a period of six months or more elapses without good control, poor control, or without any control at all, the opacity is then likely to develop, and he further claims that if the case is under complete control or has been standardized for approximately six months, then rarely is there any further development in the cataract. After they reach a certain stage, they remain stationary.

Diabetic cataract is very similar, and may be confused with other endocrine cataracts, such as parathyroid and tetany cataracts. In this the location is very similar, and the opacities are in the deep portion of the cortex, but frequently they have a blue and green color. Other types of cataracts due to glandular disturbances are cretinism, myotonia, atrophica, and Mongolian idiocy. All these opacities are very similar in location and appearance, and without a history and physical examination, are extremely difficult to differentiate from diabetic cataract.

#### EPIDEMIC KERATOCONJUNCTIVITIS

DR. H. MAXWELL LANGDON, DR. VAN M. ELLIS, and DR. ROBERT D. MULBERGER said that epidemic keratoconjunctivitis was first reported by Hogan and Crawford in 1942 (*Amer. Jour. Ophth.*, September, 1942). It is characterized by congestion and swelling of the conjunctiva and lids; at times, a false membrane, more likely to be on the conjunctiva of the lower

lid; frequent enlargement of the preauricular glands; and round or ovoid dots on the cornea just below Bowman's membrane which are highly refractile and may break down and show some slight staining.

Cases in the eastern part of the country have not differed from this description. The course of the condition is very irregular and there is no specific treatment although injection with convalescent blood has not been tried. In many cases there was a preëxistent slight injury or inflammation of the eye from a week or two weeks previously. Cultures show indifferent growth—usually diphtheroids or *Staphylococcus albus*.

Major Murray Sanders (MC) in 1942 reported the finding of a virus which produced encephalitis in mice, and after injection into a healthy man, who acted as a volunteer, produced a conjunctivitis; corneal complications, however, were not mentioned.

The corneal dots may entirely disappear or leave faint gray areas behind them. The cases they saw had complete recovery of vision to normal or better, although in one case it was reduced to 5/30 during the acute phase. In none of the cases were they able to trace any definite connection with an infected case. They regarded the corneal dots as the most definite diagnostic point.

Treatment consisted mainly of boric acid and holocain solutions for the discomfort; ice compresses for the swelling; tannic acid or silver nitrate for the catarrh of the conjunctiva; and in the later stages 10-percent boric-acid ointment for massage, which, they felt, aided in the clearing of the cornea.

They had 45 patients with corneal complications; 31 male, and 14 female. Both eyes were involved in 7 patients; the right eye in 23; and the left eye in 15.

Some of the most severe cases were

binocular, and it was felt that these patients were particularly susceptible. There were about 25 other cases which represented the conjunctival type of the condition, and in which there were no corneal complications.

*Discussion.* Dr. Edmund B. Spaeth said that Dr. Brealey presented an analysis of some 300 cases of this form of keratoconjunctivitis at the Academy meeting, in 1943. He emphasized the fact that when these patients recover, they usually continue their recovery. Also, their symptomatology may disappear, while they still have clinical signs of disease of the infiltrated cornea. For that reason the patient presented here is interesting.

This patient reported 10 weeks ago with a severe unilateral keratoconjunctivitis of the epidemic type. It was so severe that she had to be hospitalized. Ten days later she was out of the hospital, and 10 days afterwards, she returned to work. Six weeks later, she returned with the lids of the right eye swollen with edema, lacrimation, photophobia, and a sticky discharge. The condition was not a recurrence because she had not recovered, although she had apparently recovered for all clinical purposes, but six weeks later she had symptoms almost as severe as the first time.

He stated that, in his opinion, the best treatment is cold compresses in the early stages, heat later, adrenalin, and enough holocaine to keep the patient comfortable. Sulfathiazole proved of no value whatsoever. As a matter of fact, it seemed to cause irritation. Specific serum, if administered very early in the condition, relieves the symptoms to a marked degree, and apparently shortens the course of the disease.

Dr. A. G. Fewell said that during the keratoconjunctivitis epidemic he saw

about 12 cases. His experience was the same as that of Dr. Langdon in that no two cases were in the same family. They came from scattered areas and all had glandular involvement. Mucopurulent secretion was not present in any of his cases, although there was considerable tearing and some ropery secretion. The majority of his cases were bilateral, and all but one had some involvement of the cornea. The one patient who had no involvement of the cornea was the only one who was given convalescent serum, and cure was effected within a week. The other cases were treated with holocaine and adrenalin. After the appearance of the corneal lesions, the majority of them were treated with Pregl's solution, which seemed to help clear up the corneal opacities a little more rapidly than those in which it was not used.

Dr. Solomon Brav said that in most cases there are chemosis and severe burning of the eyes. He had not seen any cases in which there was mucopurulent discharge. He stated that in his experience there has occurred a distribution of the infection in one family. It is probable in some cases that the mode of transmission is through the doctor's office.

Dr. Irving L. Pavlo said that at Wills Hospital there have been several hundred cases of this condition during the past year. There have been several waves of infection among clinic patients with glaucoma who have had their tensions taken at short intervals with the same tonometer which must have been insufficiently sterilized. Also, in the cataract wards there were several severe waves of infection, twice necessitating a quarantine. Most of the epidemiologic evidence pointed to an incubation period of 8 to 11 days, more often the latter. This was shortened in the case of the postoperative cataract extractions, in many of which



the full-blown disease appeared by the second or third postoperative dressing. It was interesting to note that none of these cases had any intraocular complications.

Dr. H. Maxwell Langdon said that for clearing up the corneal opacities a 10-percent solution of boric-acid ointment massaged on the eye and placed under the lids is beneficial.

#### EXTERNAL OPHTHALMOPLÉGIA

Dr. VAN M. ELLIS presented the case of a young Negro girl. She was first seen at the Presbyterian Hospital Clinic when she was 1½ years old, at which time the mother stated that both eyelids had been drooping for the past two weeks. Her case had been followed in the Clinic up to this time.

The findings when last seen were as follows: The vision of the right eye was 6/30, and of the left eye 6/12, with correction. The pupils were normal. The patient had a ptosis; complete third-, fourth-, and sixth-nerve palsies. The eyes were immobile and the right eye diverged about 20 degrees. The internal structures of both eyes were normal.

The neurologic report, other than the ocular findings already described, was negative. The pediatric consultation suggested that the condition was the result of congenital lues; however, repeated Wassermann tests had all proved negative. Palpable epitrochlear glands were present. There was, however, a definite family history of lues. Myasthenia gravis had been ruled out by therapeutic tests, prostigmine, and electrical reaction tests. Complete physical examination, including laboratory tests and spinal-fluid examination, was negative.

Hence, this was believed to be a case of external ophthalmoplegia, etiology undetermined.

*Discussion.* Dr. Walter I. Lillie said

that this case was very suggestive of a congenital absence of the posterior longitudinal bundle, inasmuch as there was complete paralysis of ocular rotations of both eyes but pupillary reflexes were not involved. He suggested that caloric tests be done on this patient to see if nystagmus could be produced by stimulating the semicircular canals. If nystagmus is produced, it would show that there is still function in the posterior longitudinal bundle, and the lesion would be supranuclear.

#### EXUDATIVE CHOROIDITIS

Dr. I. L. PAVLO (by invitation) said that a 26-year-old man was seen at Wills Hospital on November 3, 1943. He complained of blurred vision of the right eye which occurred three weeks previously, or 10 weeks after onset of a typical pneumonia that had left a residuum of hoarseness and persistent cough with much tenacious, nonfoul, mucopurulent, blood tinged sputum. Visual difficulties began after a night of severe coughing.

The right eye showed small gray keratic precipitates and aqueous flare. The lens was clear, the vitreous slightly hazy, and there was a light yellow-gray, 2½-D.D. exudate over the macula and disc, elevated 2 diopters. This area contained small hemorrhages, the veins were dilated, and perivasculitis was present. The visual field showed a 34 by 43 cm. caecentral scotoma. The vision, R.E., was ¼/60.

Examination of the left eye was completely negative and the vision was 6/6.

Two badly carious teeth were extracted. An acute maxillary sinusitis was drained, yielding frank pus which, unfortunately, was not examined bacteriologically. Ten days later the sinuses were clear.

There were rales at the base of the left lung. X-ray study showed homogeneous

haziness over the left lower lobe, with some faint mottling, thought not to be tuberculous. The heart and blood pressure were negative.

The possibility was entertained that this was a typical chronic B. Friedländer pneumonia. B. Friedländer was found in pure culture in the sputum, which contained no acid-fast organisms. Successive sputa contained progressively fewer B. Friedländer in mixed culture; no typing was performed. Prostatic smear, urinalysis, serologic tests, blood sugar, sedimentation time, and brucellosis agglutination tests were negative as was hemocytology except for leukopenia of 4,500; 0.0002 mg. P.P.D. produced a 2+ reaction.

The patient had a subfebrile temperature which gradually fell to normal levels. His cough slowly cleared. The exudative choroiditis showed progression in extent and severity, at one point suggesting early proliferating retinitis.

The morphologic, cultural, manifold pathologic, and serologic properties of B. Friedländer or *Bacillus mucosus capsulatus* were discussed. The unusual, chronic type of pneumonia caused by this organism is quite consistent with the clinical picture presented by this patient. People in the younger age groups are found to have a definite resistance to the organism.

Investigations of the pathogenesis of uveitis rarely unearth evidence susceptible of scientific proof as attested to by Berens *et al.* in their negative blood, aqueous, and pharyngeal cultures including virus and brucellae in 91 such patients. Morphologic or cultural proof of actual uveal invasion of an organism is rare, as is evidence of direct irritation by bacterial endo- or exotoxins. Hypersensitivity to allergins produced by bacterial foci rests on evidence chiefly of a clinical nature, and admits of wide divergence of

opinions as to the relative importance of pyogenic foci and tuberculosis and syphilis.

In summary, this patient with exudative choroiditis presented an unusual variety of possible etiologic factors, including a B. Friedländer pulmonary infection.

*Discussion.* Dr. W. E. Fry said that he examines these cases of exudative choroiditis very carefully in the hospital, and it has been his experience, and it probably corresponds to that of others, that in a number of cases the cause is not found, or that the cause of the ocular difficulty cannot be definitely ascertained. This case falls in just the opposite group. There are so many causes for the exudative choroiditis that any one can be chosen. The present findings, although not absolutely definite, suggest that the real cause is a pulmonary complication.

#### EPIBULBAR TUMOR—CASE REPORT

DR. W. E. FRY presented the case of a 62-year-old woman who, in April, 1915, first noted a small pigmented lesion at the limbus of her left eye at the 1-o'clock position. In October, 1916, the lesion measured 4.5 by 2.5 mm. and extended 1.5 mm. onto the cornea. The nodule was excised in January, 1920, and the pathologic report was melanosa sarcoma. The nodule was excised a second time, and the thermophore was applied three times. The lesion recurred locally, and travelled about the limbus in a counter-clockwise direction. He stated that the patient then reported to him for treatment and the eye was enucleated in April, 1941. There was no evidence of metastasis and the patient remained well.

A pathologic report of the enucleated eye was made. The section of the eye revealed a deeply pigmented tumor mass near the periphery of the cornea. The mass in the section measured 3 mm. It

was composed of pigmented, elongated spindle cells. The nuclei were deeply stained and varied moderately in size. The associated inflammatory reaction was shown by clusters of polymorphonuclear cells. All of this tumor mass was superficial to Bowman's membrane. The tumor mass was partly divided by a band of dense connective tissue. All of the superficial portion of the cornea was involved to a varied degree by tumor cells. These were seen at places within as well as below the epithelium, and beneath superficial bands of connective tissue. A band of partly hyalinized connective tissue spread across the cornea above Bowman's membrane. Bowman's membrane was unbroken, and the stroma beneath it appeared normal.

The remaining portions of the eye were uninvolved with one exception; there was an unusual number of pigment granules in the corneoscleral trabeculae.

*Conclusion.* Certain portions of this report may be emphasized. The case described had been followed for 28 years. The tumor was of a type ordinarily considered highly malignant, melanoma or malignant melanoma. In spite of the recurrences, final pathologic examination revealed that the corneal involvement was entirely superficial. There had been no distant metastasis—had there been this patient would have died years ago. The tumor apparently possessed only the property of local recurrence.

An additional point of interest is that,

although the cornea under the microscope appeared remarkably clear, visual acuity was below 6/60. This is of importance in correlating experimental corneal disease, and the effective result of treatment.

*Discussion.* Dr. James S. Shipman asked Dr. Fry why radium was not used in the case reported, and what might have been the result if radium had been used. In most of the cases seen at the Wills Hospital irradiation before excision is advised and has been followed quite routinely for epibulbar growths. After excision, a correct diagnosis can be made, and further irradiation carried out if indicated.

He said that it has been stated that Colonel Ash thought irradiation unnecessary in carcinoma. He said that he would like to know why that is true, and if the same thing is true in cases of melanoma.

Dr. Fry, in closing, said that this patient had been seen at the X-ray Department at the University and irradiation was contraindicated. He stated that he thought Dr. Shipman was quite correct as far as the opinion of some doctors is concerned. For instance, Dr. Reese in a recent discussion of treatment of precancerous melanosis of the conjunctiva recommends excision and irradiation by applying radon directly to the site of the growth.

Warren S. Reese,  
*Secretary.*

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## PSYCHOLOGY AND EYE EXERCISES

Every day, thousands of patients throughout the land ask their oculists for an opinion on the value of "eye exercises." These questions are based upon statements read in books or magazine articles; or upon the extravagant claims made by the least scientific and the least scrupulous of optometrists, or by practitioners of medical heterodoxies who see a chance to profit by public interest in the subject.

The average patient or parent asking such a question has only very faint no-

tions as to a distinction between the application of the term "eye exercises" to the direct function of vision on the one hand, and its use with regard to the behavior of the muscles which move the eyeball, or to the function of binocular vision, on the other hand. It must be recognized, also, that some general physi- cians are not much more enlightened in this respect than the average layman. Yet the distinction is important.

In the popular press and the public mind, most of the recent trumpeting as to eye exercises relates to the supposition that optical defects of the globe, produc-

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ing nearsightedness or farsightedness or astigmatism, may be corrected without the wearing of glasses, by resort to the so-called exercises advocated by Bates and his followers, of whom one of the latest is the visually handicapped novelist and essayist Aldous Huxley.

The public mind has displayed a much less significant interest in orthoptics, which aims to remedy defective control of the muscles that move the eye, or faulty association between the two eyes as to the function of binocular vision. This lesser display of interest depends mainly upon the fact that only a relatively small number of people are directly affected by the problem, whereas a very high percentage of the population is faced by the need for wearing glasses to compensate for errors of refraction.

Eye physicians have rather generally favored the attempts to improve external muscular control, and the function of binocular vision, by the type of eye exercises known as orthoptic training, although many eye physicians are still rather doubtful as to the frequency with which substantial and lasting benefit is derived from such training. The claims put forward as to exercises associated with the names of Bates and Huxley are condemned by the overwhelming majority of eye physicians as false, unscientific, and often dishonest. Eye physicians generally, from their understanding of the structure and physiology of the eye, know that it is ridiculous to suppose that any such system of eye exercises could so change the length of the eyeball or the curvature of its essential structures as to overcome the need for glasses to correct farsightedness, nearsightedness, and astigmatism.

At the 1943 meeting of the American Academy of Ophthalmology and Otolaryngology, Lancaster presented a paper under the title "Present status of eye ex-

ercises for improvement of visual function" (Archives of Ophthalmology, 1944, volume 32, page 167; also Transactions American Academy of Ophthalmology and Otolaryngology, 1944, 49th meeting, page 413). This paper has recently been made the subject of editorial comment in the Journal of the American Medical Association (1944, volume 126, page 771).

Lancaster emphasizes the fundamental biologic fact that repetition of an act facilitates its performance, tends to the acquisition of skill and efficiency. This principle underlies the practice of orthoptics, in which it is often necessary to replace faulty by correct habits of performance. As regards the function of binocular vision or the visual capacity of an eye which is anatomically normal, but in which poor visual acuity appears due to lack of use or lack of training of the eye and brain, the eye exercises of orthoptics may actually improve sight. To a certain degree this experience conflicts with the general rule that "the only way to improve sight is to get a better image on the retina."

The influence of cerebral training upon perception is seen in the daily phenomena of hearing, where faint sounds are recognized or interpreted through their associations. It is particularly manifest in the student of a foreign language, who may have an excellent knowledge of vocabulary and phonetics but may be utterly defeated in his efforts to grasp the sounds of the language as spoken by a native.

The same principle is illustrated in the experience of a highly intelligent blind person who has made a partial study of Braille but who tells us that he gets a false sense of competence from the fact that he is reading selections from the classics, with which he was long ago familiar, and therefore knows in advance what is coming. Give the same student of

Braille an entirely "unseen" and unfamiliar passage, and he is lost.

Lancaster's paper dismisses in very few words the structural changes, apart from those in the external muscles, which are claimed to result from "eye exercises." "Frankly," he says, "I am skeptical of such an effect." He quotes the saying of Jesus: "Which of you by taking thought can add one cubit unto his stature?" Yet the article contains two or three statements which are likely to be lifted out of their context and applied in support of the Huxley-Bates point of view. Thus we have the aphorism: "Seeing is only half ocular; the other half is cerebral." We are further told that "buried in a mass of what to ophthalmologists seem foolish gestures and performances, best defined as hocus-pocus, there are sound and fruitful ideas." Also, as to the cerebral part of ocular synthesis, it is suggested that "ophthalmologists have neglected this field and have concentrated their attention on the primary source of sensation, the image on the retina, leaving to irregular, untrained workers the cultivation of that field." The facility with which such statements may be made to assume a detached and exaggerated significance is illustrated by the fact that the short editorial comment in the *Journal of the American Medical Association* dwells chiefly upon these very passages from Lancaster's paper.

As the present writer has pointed out (*American Journal of Ophthalmology*, 1943, volume 26, page 202), "such parts of Huxley's volume as have any value at all have been lifted from the works of writers on psychology." The same is true of other advocates of the Bates system.

Physicians, outside the ranks of the psychiatrists, are pretty well accustomed to being told that they do not devote sufficient attention to the importance of psychic or psychologic influences. But it is

probable that most physicians do give more or less attention to this factor in health and disease. They could hardly be successful in handling patients if they completely ignored mental influences. On the other hand, it is possible to attach too much importance to the psychic factor. Certainly a good many followers of another eminent Bostonian carry to a ridiculous degree the emphasis on mind and a professed disregard of the material basis. The act of walking might be described as one half muscular and the other half neural and cerebral. But wasted muscles cannot produce the act of walking, no matter how perfect the nerve action or how keen the volition. In a superlative degree, good sight depends upon accurate retinal function, which in turn is influenced by the structure of cornea and lens and the length of the eyeball.

W. H. Crisp.

## EYE CARE FOR OUR RETURNED SOLDIERS

All ophthalmologists are interested in the quality of the treatment being given to the wounded and diseased eyes of our returning soldiers and sailors. Col. James Greear gave a very reassuring talk on the subject as it pertains to the war blinded at a dinner at the last meeting of the American Academy of Ophthalmology and Otolaryngology. At the end of October the writer had the privilege of visiting the O'Reilly General Hospital at Springfield, Missouri, where he saw what was being done for ocular injuries and eye diseases in our soldiers from overseas. This is one of eight general hospitals that have been designated for the care of these eye cases in addition to certain other types of special work.

A good train service connects this Hospital with Saint Louis and points East, but patients are for the most part, trans-

ported to the Hospital by air, landing from ambulance planes at the nearby air-drome. They arrive from the battle fields of Europe in a surprisingly short time, often only a matter of a few days after the injury or illness is incurred.

About 250 beds of this 3,500-bed Hospital are assigned to ophthalmic patients; of these some 135 were in use on the day of the writer's visit. The Hospital is composed of a series of connecting one-story buildings of frame and composition construction. They are equipped with every modern device that would assist in the diagnosis or treatment of patients. The operative set-up is of the best, but most important of all is the well-trained personnel of the staff assigned to the care of eye patients.

The organization is fortunate in having as Commanding Officer General Foster, who has an advanced point of view as regards the whole enterprise. He has surrounded himself with capable young men and has inspired in them a fine *esprit de corps*. The eye service is also fortunate in that Lt. Col. Edward P. Burch, II, is assistant to the General, because Colonel Burch is a well-known ophthalmologist who, therefore, has an especial interest in the eye patients, although no longer in charge of the ophthalmic division. This position is now held by Major Perry, another capable ophthalmologist. Under him are Captains Swift and Sherman. The latter has responsibility for the ophthalmic plastic surgery of which there are many cases. There were approximately 40 patients undergoing this type of reconstruction at the time of the October visit. Dr. Sherman, having been trained by Dr. John M. Wheeler, was using the methods advocated by him and was doing excellent work.

One of the major eye problems in these base hospitals, where definitive treatment is carried out, is that of uveitis; many

cases are seen and every opportunity for complete studies of them is offered. This was the subject of Captain Swift's paper at the evening meeting, where he discussed 100 cases of this malady. The afternoon clinic included many patients suffering from uveitis. The etiology seemed to differ little from that found in civil life, and, unfortunately, recovery was just as slow and uncertain.

At O'Reilly General Hospital very fine work on the construction of artificial eyes from acrylic material is being done by Major Hahn of the Dental Corps. These eyes are tailormade for the patient. Excellent fits are possible because of the molding of the model in the socket. Life-like irides are painted on plug buttons which are embedded in the molds in the correct situation. Conjunctival vessels are cleverly imitated by variously colored nylon threads planted in the "scleral" surface. When asked how fragile these eyes were Major Hahn responded by throwing one of them at full force on the composition floor. It bounced 8 to 10 feet and on recovery showed no sign of the abuse. Major Hahn says that there are still some "bugs" in the process but all can probably be removed.

Taken as a whole and in every detail, ophthalmologists can rest assured that if the other seven ophthalmic bases are on a par with the O'Reilly General Hospital in care of ophthalmic cases the very best attainable is being done for our soldiers.

Lawrence T. Post.

## BOOK NOTICES

THE ROMANCE OF MEDICINE. By Benjamin Lee Gordon. Clothbound, 864 pages with index and many illustrations. Philadelphia, F. A. Davis Co., 1944. Price \$5.00.

This volume should be of special in-

terest to the ophthalmologist because of the large role that eye diseases and superstitions play in the history of medicine.

The author has unearthed an amazing amount of folk-lore and historical facts about the art of healing. He has also selected an unusually pertinent collection of illustrations. No physician can fail to find much that is of great interest in the book. Undoubtedly, in such a compendious undertaking there are a number of errors, but these are of minor significance because the treatise is written presumably with the primary intention of creating interest rather than as a reference book of encyclopedic accuracy.

The chapters divide the subject perhaps a little artificially, but it is difficult to maintain an over-all continuity in a work of this kind. The reader found the book not one to be consumed from cover to cover uninterruptedly, but this is an end almost impossible of attainment in these days when every newspaper contains material so thrilling and so vital that literature other than current has difficulty holding the attention at all. Notes on each chapter precede the index.

"The romance of medicine" will be found a pleasant diversion as well as a means of agreeably enlarging one's knowledge of interesting facts in the development of medicine. Perhaps it will be most enjoyed as a book to be picked up intermittently for an hour or two's reading. The author and publisher are to be congratulated on the splendid appearance of the volume at a time when most books are made of such poor material and have such blurred illustrations that there is little hope of their survival in the libraries of the future.

Lawrence T. Post.

Portuguese.) By Octacilio de C. Lopes. Paper covers, 146 pages, 13 illustrations, Livraria Atheneu Jose Bernades, Rio de Janeiro, Brazil, 1944. Price not stated.

This well-arranged and clearly written monograph consists largely of a review of the world literature of the subject, with three important chapters devoted respectively to etiology, pathogenesis, and pathologic anatomy. A chapter of fourteen pages is devoted to circumstantial accounts of a number of cases from the author's personal experience.

W. H. Crisp.

## CORRESPONDENCE

### OPHTHALMOLOGY IN PARIS

November 22, 1944

Editor, American Journal of  
Ophthalmology:

The first meeting of the Société d'Ophthalmologie de Paris since the Liberation was held at the Faculté de Médecine on the 31st of October, 1944. Those present were Drs. Favory (president), Prélat (secretary general), Bégué, Rollin, Guillaumat, Voisin, Desvignes, Bailliart, Légard, Chappé, Gallois, Offret, Bruneau, Kalt (the younger), Lavat, Nectoux, Mérigot, Dubois, Charpentier, Dollfus, Blum, Bollack, and Coutela. Col. Derrick Vail, Senior Consultant in Ophthalmology, E.T.O., U. S. Army, was the guest of honor. The program consisted of the following case reports and papers. "A case of grippotyphosa leptospirosis with ocular complications," by Drs. Dollfus and Denechau; "A case of severe bilateral photo-traumatic retinitis in a wounded soldier," by Dr. Dollfus; "Barbituric amaurosis with evolutionary accidents," by Drs. Offret and Ardonin; and "Spontaneous detachment of the choroid—a rare complication of furunculosis," by Dr. Hébert. Dr. Fa-

OFTALMIA SIMPATICA (SYMPATHETIC OPHTHALMIA). (In



very graciously welcomed the American ophthalmologists and invited them to attend all future meetings. There was much discussion over ways and means by which the Society could help their distressed members and confrères who had suffered loss of equipment and supplies during the Battle of France. Colonel Vail extended the sympathy of the American colleagues and requested information so that some measure of assistance might be given by the ophthalmological societies of the United States.

Undisturbed by the Huns, the Society held its meetings regularly during the occupation. Its famous Bulletin, however, could not be published due to lack of paper and authority. Several of its members suffered personal harm and damage at the hands of the unspeakable Hun. The relief of freedom and an electric feeling of joy pervaded the group.

The following is a note which Dr. Magitot wrote at my request giving information regarding his activities during the German occupation of Paris. I think this will be of interest to us in the Journal.

"Dr. Magitot sends all his American friends his kindest regards and best remembrances. He is now back in Paris. He was considered by the Germans to be a Jew by his marriage, and consequently his home, estates, books, and professional equipment were seized. To avoid deportation, all of his family scattered and had to hide during the four years. Now that liberation has come, he believes he must rejoice to find himself, wife, and children still alive.

"The eye department in the Lariboisière Hospital, where he used to work, and the Rothschild Foundation of the Rue Marin, have been taken and plundered. It will need much time before these clinics can be run again.

"The Annals d'Oculistique is planning

to issue a first number in January, 1945, if paper is available. During these past years in exile from Paris, Dr. Magitot has written a 'Clinical physiology' which is now being printed by Masson et Cie. Another book 'Textbook on ophthalmology,' written with Dr. Bailliart, is ready but cannot be published until paper is obtained.

"Anxious to know about the ophthalmologic activity in the States during this war, Dr. Magitot would highly appreciate it if his American colleagues would send him reprints. He is happy that he will hear from his American friends as soon as regular mail is restored."

(Signed) Derrick T. Vail.

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#### ON DIVERGENCE EXCESS AND POSTURAL TONUS

To the Editor:

Captain Posner, in the October number of the Journal, deals with some important aspects of ocular motility but does not carry through his thinking with complete consistency perhaps because he is still under the spell of the old ideas which he is aiming to correct.

He takes as his text a case of anisometropia: O.D. +0.25 cyl. approximately emmetropic; O.S. fairly high H. As was to be expected, the tests for heterophoria give different results according to which eye is made to fixate, the tests being made without glasses. When the emmetropic right eye fixates there is no accommodation required and therefore no impulse to converge excited by accommodation. The phoria is an exophoria which is the true or underlying phoria uninfluenced by other reflexes than the basic tonus reflex and the fixation reflex from the right retina. When the hypermetropic left eye fixates a large amount of accommodation is required (probably 3D., as 2.50D. was found with the partial cycloplegia pro-

duced by homatropine, no test of accommodation at the time of measuring the refraction being recorded—unimportant perhaps). The effect of this accommodation of over 2.50D. is to excite a corresponding convergence. Result: esophoria. A not unusual finding. (If tested with correction it is certain that the correction left some uncorrected H for the accommodation to take care of.)

It is surprising that Captain Posner says nothing about this factor of the accommodation reflex as he was emphasizing the importance of the reflexes which he rightly lists as these: (1) the underlying tonus, (2) the fixation which includes the focusing, (3) the fusion. He might have cited the tendency of tonus to hold over. Thus if a person with no hyperphoria is made to wear a prism 2<sup>A</sup> base down for a few hours he will show a hyperphoria for some time thereafter as the tonus required to overcome the prism persists. Similarly the accommodation necessitated by H tends to persist.

He rightly stresses the importance of abandoning the notion of position of rest. And yet he does not consistently use the preferred term fusion-free-position probably as a concession to custom. He says: "there is a characteristic 'position of rest' for each state of *activity* of the central nervous system" (*italics mine*). Obviously rest is the direct antithesis of activity. Nor does he carry through the correction of this mistaken idea of a position of rest to include the mistaken but widely prevalent idea of mechanical or anatomical factors being the fundamental cause of most cases of heterophoria and heterotropia instead of only a few.

Bielschowsky made many valuable contributions to our understanding of ocular

motility and binocular vision but his mistaken conception of a position of rest (modified later to a relative position of rest) with its corollary of the anatomical or mechanical basis of most phorias and trophias must be abandoned if we are to achieve a sound logical conception of this important subject.

I commend the following references to Captain Posner; there are passages in each of them confirming his views on position of rest and on reflexes and carrying them farther than he has done:

"Physiology of disturbances of ocular motility," Arch. of Ophth. v. 17, p. 983.

"Detecting and interpreting ocular deviations," Arch. of Ophth. v. 22, p. 867.

"Ocular motility," Amer. Jour. Ophth., v. 24, pp. 485, 619, 741.

"Terminology in ocular motility," Amer. Jour. Ophth., v. 26, p. 122.

Walter B. Lancaster, M.D.  
Boston, Mass.

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#### CORRECTIONS

November 10, 1944

Editor, American Journal of Ophthalmology:

The following errata appeared in my paper "Backflow phenomena in aqueous veins."

On page 1078, in table 2, the number of "negative eyes" should read 30 (namely 23 plus 7), not 20.

On page 1088, ninth line from bottom of page: instead of "2. that along the convex border," should read: "2. that along the concave border." The word "convex" in the neighboring line, however, is correct.

(Signed) K. W. Ascher.

# ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

## CLASSIFICATION

- |  |  |
|--|--|
| 1. General methods of diagnosis                        | 10. Retina and vitreous                                |
| 2. Therapeutics and operations                         | 11. Optic nerve and toxic amblyopias                   |
| 3. Physiologic optics, refraction, and color vision    | 12. Visual tracts and centers                          |
| 4. Ocular movements                                    | 13. Eyeball and orbit                                  |
| 5. Conjunctiva   | 14. Eyelids and lacrimal apparatus                     |
| 6. Cornea and sclera                                   | 15. Tumors   |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries   |
| 8. Glaucoma and ocular tension                         | 17. Systemic diseases and parasites                    |
| 9. Crystalline lens                                    | 18. Hygiene, sociology, education, and history         |
|  | 19. Anatomy, embryology, and comparative ophthalmology |

### 6

#### CORNEA AND SCLERA

Krutova, A. H. Sulfanilamide in the treatment of corneal ulcers. *Viestnik Oft.*, 1943, v. 22, pt. 3, p. 43.

In the treatment of corneal ulcers Krutova found local application of sulfanilamide powder more effective than the application of any other therapeutic agent. It cleanses the cornea of purulent infiltrates, and pain is relieved in one day. The drug has no effect on hypopyon, which may continue to increase in spite of the fact that the ulcer is getting clean. Final cicatrization of the ulcer is delayed longer than usual, and epithelization still longer. Apparently sulfanilamide retards the regenerative process. Ray K. Daily.

Scholz, R. O. Unsuccessful treatment of syphilitic interstitial keratitis with sulfanilamide. *Arch. of Ophth.*, 1944, v. 32, July, pp. 68-69.

In view of the conflicting reports in the literature, four patients with congenital syphilitic interstitial keratitis

were treated in the Johns Hopkins Hospital with ordinary antisyphilitic therapy plus sulfanilamide in large doses. In none of the cases was there any significant improvement which might be attributed to this therapy. One of the patients was also given a second course of treatment with sulfanilamide plus riboflavin, without result. The four cases are reported individually. (References.)

R. W. Danielson.

Strakov, V. P. Ophthalmic successes in corneal transplantation. *Viestnik Oft.*, 1942, v. 21, pt. 6, p. 28.

The wide application of corneal transplantation dates from 1924, when Filatov and his coworkers at the Ukraine Research Institute began to work on the technique of the operation, and interested a number of ophthalmologists in the work. They developed a suitable instrumentarium, and issued numerous publications on the various aspects of this type of surgery.

Ray K. Daily.

7

# UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Figueiredo, N. P. de. *Subsalicylate of bismuth in treatment of luetic internal ophthalmoplegia*. Rev. Brasileira de Oft., 1944, v. 3, Sept., pp. 3-11.

A white soldier aged 25 years, suffering from severe dental caries, noticed in the right eye a disturbance which interfered with vision for close work. The right eye showed vision of two thirds for distance, but needed plus 3.25 sphere to obtain normal vision at the reading range. The left eye had normal vision for both distance and near. In the right eye the pupillary reflex to light and accommodation, both direct and indirect, was absent. All these reflexes were normal in the left eye. Attention was first directed to the diseased teeth, but no improvement had occurred after an interval of one week. The Kahn blood test proved strongly positive, and the patient was given a course of intramuscular injections of subsalicylate of bismuth, one c.c. weekly. Improvement was noted soon after the sixth injection, and the Kahn test was then negative for the first time. Four days after the tenth injection, the Kahn was still negative, and vision was normal for both near and distance, with normal pupillary reflexes.

W. H. Crisp.

Kinsey, V. E., and Grant, W. M. *The secretion-diffusion theory of intraocular fluid dynamics*. Brit. Jour. Ophth., 1944, v. 28, July, pp. 355-361.

This paper is a recapitulation of the authors' theory of intraocular fluid dynamics, and a discussion of criticisms made by Duke-Elder and Davson of the mathematical concepts used in developing the theory.

It was found that the total water movement into and out of the anterior chamber of the rabbit was approximately fifty c.mm. per minute, a rate far in excess of what was thought to be the rate of formation of the aqueous humor as a whole. This is believed to suggest that perhaps the various constituents of the aqueous humor may enter the anterior chamber at different rates. To test this hypothesis, the rates of accumulation of various substances in the anterior chamber were determined, as was also the concentration of these substances in the plasma. It was found that electrolytes entered the anterior chamber as a result of secretion, while nonelectrolytes entered by diffusion. It is believed that both electrolytes and nonelectrolytes leave the anterior chamber by a process of flow. (References.)

Edna M. Reynolds.

Wagener, H. *Toxoplasmic chorioretinitis*. Amer. Jour. Med. Sciences, 1944, v. 208, Aug., p. 255.

The rather recent discovery that the toxoplasma, a highly organized protozoan parasite, can invade the tissues of the eye and cause destructive lesions of the choroid and retina, has introduced further complexity into the etiologic study of chorioretinal disease. The author reviews cases from many references, with opinions of various authors on the subject, and particularly quotations from a recent article by Vail. There is a predilection for the macular area, and the lesions are usually bilateral and multiple. Diagnosis from the ophthalmoscopic appearance alone appears indefinite. The decision may depend upon demonstration of neutralizing antibodies in the blood serum. A positive complement-fixation reaction does not in all cases indicate active or even recent infection. There

seems to be no very satisfactory treatment, though various forms of sulfonamide have been tried.

Theodore M. Shapira.

## 8

### GLAUCOMA AND OCULAR TENSION

Ascher, K. W. Backflow phenomena in aqueous veins of normal and of glaucomatous eyes. *Amer. Jour. Ophth.*, 1944, v. 27, Oct., pp. 1074-1089. (4 figures, 3 tables, 3 in color, references.)

Bertotto, E. V. Chronic simple glaucoma. *Anales Argentinos de Oft.*, 1943, v. 4, Oct.-Nov.-Dec., pp. 152-166.

The author accepts Magitot's inclusive definition of chronic simple glaucoma as an affection characterized by a particular optic nerve atrophy, circulatory modifications, and intraocular hypertension. Among disputed initiating factors are endocrine instability and neurovegetative derangement. The theories of pathogenesis include the circulatory, the hypersecretive, and the theory of diminished fluid absorption (or mechanical theory). There are found differences of opinion as to whether to operate early or late. The author feels that surgery is definitely indicated when the visual fields continue to contract in the face of topical medical care. (One table, fields).

Edward Saskin.

Evans, J. N. The macula-wedge scotoma a prognostic index in glaucoma. *Amer. Jour. Ophth.*, 1944, v. 27, Oct., pp. 1090-1093. (2 figures.)

Gartner, S., and Lambert, R. K. Tenotomy of the rectus muscles in glaucoma. *Amer. Jour. Ophth.*, 1944, v. 27, Nov., pp. 1228-1231. (References.)

Hess, Leo. Pathogenesis of acute glaucoma. *Arch. of Ophth.*, 1944, v. 32, Aug., pp. 128-132.

According to the author, acute glaucoma may be viewed as a vegetative neurovascular crisis. Other examples of this kind of crisis are epileptic seizures and attacks of cardiac asthma associated with acute edema of the lungs. The ciliary ganglion and the vegetative diencephalic center at the base of the brain (the Karplus-Kreidl center) are thought to play predominant roles in the nervous mechanism of glaucoma. The increased intraocular pressure and many other signs of acute glaucoma are secondary to the central irritation. The congestion of the conjunctival blood vessels, chemosis, edema of the lids, and changes in the cornea commonly regarded as inflammatory, are really of angioneurotic origin. The pharmacologic aspects of this concept are discussed. (References.)

John C. Long.

Paulo, A., Jr. Late suppurative infections after fistulizing operations. *Rev. Brasileira de Oft.*, 1943, v. 1, June, pp. 193-208.

Two cases are recorded. The first patient, aged fifty years, underwent an Elliot trephining, followed by a small cyclodialysis through the scleral opening. The patient refused removal of a dental abscess. After six weeks he returned with acute signs of uveitis, including cloudiness of the anterior chamber, a small hypopyon, and a purulent appearance of the cystoid scar. The tension, previously normal or less, had risen to 22 mm. (Schlötz). A variety of medicinal and surgical procedures proved ineffective, and the eye had to be enucleated in a condition of painful atrophy, with suspicion of

sympathetic ophthalmia in the other eye.

The other patient, a man of 72 years, also underwent an Elliot trephining. Many months later he returned with an acute uveitis. Bacteriologic examination revealed the presence of a hemolytic streptococcus. In this patient, also, a dental abscess was found after the development of the acute inflammation, but evisceration proved necessary in spite of extraction of the tooth. (2 drawings.) W. H. Crisp.

Pletneva, H. A. Contributions to the study of glaucoma during the last twenty-five years. *Viestnik Oft.*, 1942, v. 21, pt. 6, p. 21.

A review of the contributions of Russian ophthalmologists in this field. Maslennikov was the first to call attention to the diagnostic importance of the daily tension curve. Samoilof described the variations in the size of the blind spot under the influence of pilocarpine, and made a comprehensive study of hypertension as a reaction to pain. Kamenetzki described an unusual form of glaucoma, observed in the Irkutsk district; it occurs only in young men, is associated with atrophy of the iris, and is inherited. Pilman studied the influence of the thyroid on glaucoma. In 99 percent of the glaucoma patients he found hypothyroidism, and the blood serum of these patients added to atropine produced maximum dilatation of the pupil. Blood serum of hyperthyroid patients inhibited the action of atropine. Fradkin, in a study of the mechanism regulating intraocular tension, pointed out the importance of conditioned reflexes. Impulses from the cortex may change so fundamental a property of cells as their permeability. The reflex rise in

intraocular tension in response to a conditioned reflex indicates cerebral participation in the regulation of intraocular tension. Maklakov was the first to conceive the idea of a subconjunctival fistula in the treatment of glaucoma. Filatov demonstrated the effect of muscular exercise on intraocular tension. From Kravkov's laboratory of physiologic optics came interesting data on the effect of white and green illumination on intraocular tension.

Ray K. Daily.

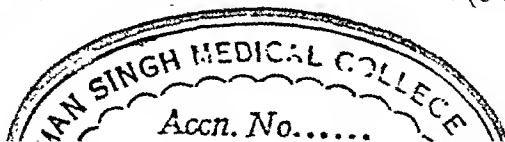
Promptov, B. A. A new miotic—proserin. *Viestnik, Oft.*, 1943, v. 22, pt. 3, p. 33.

To encourage the production of proserin, which is the Soviet drug with the chemical formula of prostigmin, the author reports its effect in clinical cases. The conclusions based on the clinical applications are that a 5-percent solution instilled into the conjunctival sac produces contraction of the pupil, and reduction of intraocular tension in glaucomatous eyes. In some cases the pupil contracts but intraocular tension remains uninfluenced. This drug does not produce the painful sensation in the eyes and temples sometimes caused by eserine.

Ray K. Daily.

Reese, A. B. Deep-chamber glaucoma due to the formation of a cuticular product in the filtration angle. *Amer. Jour. Ophth.*, 1944, v. 27, Nov., pp. 1193-1205. (14 illustrations, references.)

Wolfe, O. R., Wolfe, R. M., and Georgariou, P. Glaucoma—sclerectomy, external and suprachoroidal drainage. *Amer. Jour. Ophth.*, 1944, v. 27, Oct., pp. 1146-1148. (5 drawings, references.)



## 9

## CRYSTALLINE LENS

Bailey, J. H. A modification of the corneal section in the operation for cataract. *Amer. Jour. Ophth.*, 1944, v. 27, Nov., pp. 1253-1257. (2 figures.)

Lawes, F. A., and Halliday, J. C. Marfan's syndrome: arachnodactyly with dislocation of the crystalline lens. *Med. Jour. Australia*, 1944, v. 1, May 20, p. 465.

After an introduction regarding the history and symptoms of the disease, the authors report three cases in one family. A woman aged 52 years had "trouble with her spine" at the age of seven years, and now has a dorsal curvature of the upper thoracic portion of the spine, so that she is at present 5 feet 9 inches as against earlier 5 feet 11 inches. The sternum is unduly prominent, the hands and feet much elongated. Each forefinger measures 4 inches, the second finger 5 inches, the third  $4\frac{1}{2}$ , the fourth 3 inches. The length of the great toe is  $3\frac{1}{2}$  inches, that of the second toe also  $3\frac{1}{2}$  inches. X-ray examination of the thoracic part of the spine reveals a destructive lesion (probably healed tuberculosis) at the level of the seventh thoracic vertebra. The patient is now in good health. Her ocular conditions are: pronounced iridodonesis, dislocation of the lenses upward, visual acuity 6/36 and 6/24 unimproved by glasses. A girl aged 14 years, otherwise well built, has rather long fingers. When her pupils are dilated iridodonesis can be observed, with slight dislocation of both lenses upward. She has compound myopic astigmatism, and with correction her visual acuity is 6/9. The third patient, a boy aged six years, looks older than his age and his face longer

than in normal proportion. Notable features are long fingers and toes and winged scapulas. The chief complaint was of bad vision, and on examination pronounced iridodonesis was found, with dislocation of both lenses upward. M. Lombardo.

Lijó Pavía, J., and Morate, F. H. Senile cataract and vitamin C. *Rev. Oto-Neuró-Oft.* 1944, v. 19, May-June, pp. 84-88; also *La Semana Med.*, 1944, v. 51, Aug., pp. 275-277.

This short paper is a sequel to one written by Lijó Pavía seven years ago. The majority of cataract patients have a vitamin-C deficiency, and the elderly require more vitamin C than the young. The authors administer vitamin C perorally, intravenously, and in certain cases into the anterior chamber. In their series of selected cases of immature senile cataract, definite improvement in visual acuity was noted after vitamin-C treatment. In cases of mature cataract, however, the improvement was slight and was seen in but a few instances. Edward Saskin.

## 10

## RETINA AND VITREOUS

Arruda, Jonas de. Comments on gravidic retinosis. *Rev. Brasileira de Oft.*, 1943, v. 1, June, pp. 223-232.

Three cases are described. A woman of 28 years, previously normal, developed an acute nephritis at three months of pregnancy. The vision of each eye was one fortieth, the arterial pressure 190/120 mm. The fundi showed numerous exudative lesions, with intense retinal edema and a number of hemorrhagic foci. The ocular condition improved rapidly after surgical termination of the pregnancy, the

vision rising to right 9/10, left 8/10. But the nephritis advanced and the patient died about six months later.

The second patient, a woman of 32 years, had been found in normal condition shortly before the end of her third pregnancy. Fifteen days before the birth of the child, she noticed a rapid falling off in the vision of the left eye, the only eye in which it was possible to see the fundus or which had previously possessed good vision. The patient had the usual symptoms of headaches, dizziness, and vomiting. After parturition, she was given intense antiluetic and vitamin treatment, without result. The vision of the formerly good eye was reduced to counting fingers at one meter, and the fundus showed extensive disturbance of the macular area, including white spots and discrete pigmentation. Nine months later the eye developed a retinal detachment. (References.)

W. H. Crisp.

Brickner, R. M. Visible retinal arteriolar spasm associated with multiple sclerosis. *Arch. Neurol. and Psychiatry*, 1944, v. 51, June, p. 573.

The authors have noted a phenomenon, associated with multiple sclerosis, which so far as they know has not been previously described. In association with abrupt attacks of visual impairment consisting of shimmering and the presence of multiple dark areas, spasm of the retinal arterioles could be seen on examination with a Morton ophthalmoscope. In two cases of multiple sclerosis, spasm of the retinal arterioles was coincident with the presence of scotomas. When the scotoma receded or disappeared, the spasm also disappeared; this change followed immediately the inhalation of amyl nitrite in one case and was spontane-

ous in the other. In a third case, attacks of blurred vision were promptly relieved by inhalation of amyl nitrite.

Theodore M. Shapira.

Goldberg, S., and Newell, F. W. Sarcoidosis with retinal involvement. *Arch. of Ophth.*, 1944, v. 32, Aug., pp. 93-96.

The iris is very commonly involved in sarcoidosis whereas infiltration of the choroid and retina is rare. The authors report two cases of sarcoid with fundus lesions. The first patient was a 23-year-old Negro male who had noticed nodular swellings in both inguinal regions, followed by enlargement of the parotid, posterior cervical, axillary, subclavicular, and epitrochlear glands. A marked reduction in vision of the right eye was noted. The right eye showed much pigment and many blood cells in the anterior portion of the vitreous. There were many deep and superficial retinal hemorrhages, with thrombosis of the superior temporal vein. The macular area was edematous. Six weeks later, a white mass, extending 3 diopters into the vitreous, was present at the inferior nasal margin of the disc. The mass was superficial to the retinal vessels but was overlain by many new vessels. Chest X-rays showed adenopathy of the hilar nodes of both lungs and a generalized increase in lung markings. Biopsies of the enlarged lymph glands are typical of Boeck's sarcoid.

The second case was found in a 24-year-old Negro male. There was marked parotid swelling, swelling in the upper outer angle of the orbits, cervical adenopathy and subcutaneous nodules in the arms and forearms. The right optic disc was obscured in the inferior nasal quadrant by a grayish-



white mass approximately 2 disc diameters in diameter and extending nasalward. The mass overlay the retinal blood vessels and projected 4 diopters into the vitreous. Subhyaloid and retinal hemorrhages were present. Biopsies from the enlarged glands were somewhat atypical but were interpreted as representing sarcoid of the Darier-Roussy type. (References.)

John C. Long.

Guerry, DuPont, 3. Congenital retinal folds. *Amer. Jour. Ophth.*, 1944, v. 27, Oct., pp. 1132-1135. (One illustration, references.)

Lijó Pavía, J. Diathermic surgery of the retina. *La Semana Méd.*, 1944, v. 51, Sept. 21, pp. 606-610.

Two cases are reported, one of retinal detachment successfully treated with diathermy puncture, the other a case of Coats's disease (retinitis exudativa externa), in which the progress of the retinal disease appears to have been arrested by a similar delimiting use of the method, somewhat as recorded by Lewis, and in discussion by Guyton (*Trans. Amer. Acad. Ophth. and Otolaryng.*, 1943, May-June, pp. 357 and 360). (References.)

W. H. Crisp.

Lijó Pavía, J. Senile degeneration of the retina. *Rev. Oto-Neuro-Oft.*, 1944, v. 19, May-June, pp. 73-81.

The senile retinal change most often seen is atrophy of the outer layers of the retina, making readily visible a red, sclerotic choroid. Cystoid degeneration, macular degeneration and holes, and paramacular changes follow in order of frequency. Less frequent are pigmentary derangements such as the salt-and-pepper fundus, or pigmentary clumping, and senile exudative macu-

lar lesions. Three cases are reported representing respectively choroidal sclerosis and pigmentary atrophic changes, hypertensive and sclerotic retinal and choroidal lesions, and retinal endarteritis with partial obstruction. The accompanying serial retinographs are excellent. All three cases were given, among other things, vitamin-C therapy. Edward Saskin.

Lyle, D. J. The association between retinopathies and encephalopathies in the common cardiovasculorenal affections. *Amer. Jour. Ophth.*, 1944, v. 27, Nov., pp. 1232-1252; also *Trans. Amer. Ophth. Soc.*, 1943, v. 41, p. 541. (2 charts, 44 figures.)

Rebello, Orlando. Regarding circinate retinitis. *Rev. Brasileira de Oft.*, 1943, v. 1, June, pp. 213-218.

A woman aged 35 years had normal visual acuity in the right eye, but only one-eighth in the left eye. The macular area of the left eye showed grayish spots, and the lower half of its circumference had a halo of milky-white dots, which reached to the vicinity of the optic disc. Near the edge of the halo there was a broken line of fine pigment, while within the circumference there were discrete hemorrhagic spots. Retinal veins of normal aspect passed over the halo of dots, without showing any modification in their course. (One illustration.)

W. H. Crisp.

Rocha de Souza, Admardo. Embolism of the central artery of the retina. Treatment with retrobulbar acetylcholine. *Rev. Brasileira de Oft.*, 1943, v. 1, June, pp. 219-224.

The drug was administered by retrobulbar injection, at intervals of 12 hours, and using one c.c. at each in-

jection. Enormous edema of the eyelids occurred almost immediately after the injection. But within a few hours the vision had risen from shadows to one third. Later the vision reached normal. The 1 c.c. of the drug is combined with 0.5 c.c. of a one-percent solution of novocaine. W. H. Crisp.

Von Sallman, L., Meyer, K., and Di Grandi, J. Experimental study on penicillin treatment of ectogenous infection of vitreous. *Arch. of Ophth.*, 1944, v. 32, Sept., pp. 179-189.

From previous research, the authors had concluded that the present potent and less toxic antibacterial agents, such as the sulfonamide compounds and penicillin, introduced iontophoretically and supplemented by systemic treatment, did not check experimental endophthalmitis when the infection had spread from the anterior segment to the vitreous space. Failure attended attempts to increase the concentration of sulfadiazine in the vitreous by transcleral iontophoresis. Penicillin, also, did not enter the vitreous in detectable amounts with either local or systemic administration. Because of failure of the aforementioned methods to produce adequate concentrations of chemotherapeutic agents in the vitreous, direct injection of the drug into the vitreous space, hazardous as it seemed, was considered as a possible approach.

A single injection of 0.2 c.c. of a solution containing 2.5 mg. of sodium penicillin per c.c. into the vitreous of rabbits secured bacteriostatic activity of the vitreous fluid for more than 24 hours. Approximately the same concentrations of penicillin and sulfacetimide were found in the aqueous of rabbits after iontophoretic application of a solution containing both their sodium salts as after iontophoretic ap-

plication of a solution containing the individual salt. Topical treatment with penicillin and sulfacetimide, supplemented by systemic administration of sulfadiazine, was not more effective than local penicillin therapy in the treatment of an experimental intraocular infection with one strain of *Staph. aureus*. (2 tables, References.)

R. W. Danielson.

Wagener, H. Toxoplasmic chorioretinitis. *Amer. Jour. Med. Sciences*, 1944, v. 208, Aug., p. 255. (See Section 7, Uveal tract, sympathetic disease, and aqueous humor.)

## 11

### OPTIC NERVE AND TOXIC AMBLYOPIAS

Greeves, R. A. Retrobulbar optic neuritis: a pathognomonic sign. *The Lancet*, 1944, v. 246, June 3, p. 715.

The writer calls especial attention to one symptom which does not seem to be so commonly known as the other symptoms of the early stages of acute retrobulbar optic neuritis, including the central scotoma, partial dilatation of the pupil, and sensation of pain when the eyeball is moved. The other symptom consists in a tenderness usually experienced only when pressure is applied to the upper surface of the eyeball but limited to a spot in the middle line corresponding roughly to the site of the attachment of the superior rectus tendon. The writer regards its presence as pathognomonic of retrobulbar neuritis. The textbooks merely mention that the eyeball is tender on pressure, without specifying a limited area. The symptom is present only in the early stages of the disease. Like pain on movement, it disappears in a matter of days.

M. Lombardo.

Hammes, E. M. **Papilledema in optic neuritis and tumor of the brain.** *Med. Clinics North America*, 1944, p. 957.

The presence or absence of physiologic cupping is not a reliable criterion for differential diagnosis, for glial excess on the disc, or colloid deposits, may cover such cupping. More important in differentiating between choked disc and optic neuritis is the duration of symptoms, longer in choked disc, shorter in neuritis. Other signs discussed are headache, visual acuity, visual field, blind-spot enlargement, and X-ray evidence of tumor.

R. Grunfeld.

Scott, J. G. **Eye changes in trypanosomiasis.** *Jour. Tropical Med. and Hygiene*, 1944, v. 47, May, p. 15.

The author examined 150 patients infected with *Trypanosoma Gambiense*. Keratitis due to the disease was not common. Chorioretinitis and optic atrophy were not seen. Iridocyclitis, characterized by keratic precipitates out of proportion to the mild ciliary inflammation, was present in four hospitalized cases. Bilateral optic atrophy followed tryparsamide treatment in one case. The author recommends testing the visual acuity before each tryparsamide injection. R. Grunfeld.

Tassman, I. S. **Foster Kennedy syndrome with fusiform aneurysm of internal carotid arteries.** *Arch. of Ophth.*, 1944, v. 32, Aug., pp. 125-127.

The syndrome of Foster Kennedy has usually been considered to be indicative of a basofrontal tumor. Several cases have been reported in which the condition arose from non-neoplastic diseases involving the blood vessels. The author describes a case of this type in a woman of 32 years. Pain in the left eye was followed by progres-

sive failure in vision of that eye. When examined nine months after onset of the illness, the vision of the right eye was 6/6 partly and that of the left eye ability to see hand movements at 12 inches. The right eye showed a definite papilledema measuring 3 diopters, with marked blurring of the margin of the disc. The left eye showed a white disc with slightly blurred margins and deep central excavation. General neurologic examination revealed no other abnormality. Encephalography showed lack of sharpness of the extreme anterior horn of the lateral ventricles. Upon craniotomy on the left side, a fusiform aneurysm of the internal carotid artery was found. It was impossible to do anything to the vascular lesion on that side. At a later right craniotomy the optic nerve was found to be pressed against the upper margin of the optic foramen. To relieve this condition the roof of the optic canal was removed for approximately a half inch. From direct surgical inspection supplemented by arteriography with diodrast, it was possible to make a diagnosis of fusiform aneurysm of both internal carotid arteries, with formation of anomalous loops in the course of the arteries and compression of the optic nerves. The vision of the right eye continued to fail, so that at the last examination it was 5/200, with extensive field constriction. (References.)

John C. Long.

## 12

### VISUAL TRACTS AND CENTERS

Engel, G. L., and others. **A migraine-like syndrome complicating decompression sickness.** . . . *War Med.*, 1944, v. 5, May, pp. 304-314.

The writers describe the clinical features of this syndrome, present data

relevant to its mechanism, and direct attention to the striking similarity which the syndrome bears to clinical migraine. Visual disturbances are common among subjects experiencing decompression sickness during exposure to simulated high altitudes in a decompression chamber. These are scotomas followed by headaches and other neurologic signs such as pareses, sensory disturbances, and aphasia which are also followed by headaches. The report is based on a total of 1,361 exposures to simulated altitudes of 30,000 to 38,000 feet, in 155 subjects. Seventeen subjects experienced the reaction. The symptoms occurred repeatedly in some persons and not at all in others. Visual-field studies revealed that the scotomas were homonymous and shifted rapidly in position. Headaches were always contralateral to the scotomas, began when the latter disappeared, and were sometimes associated with nausea and vomiting. Electroencephalograms taken during this reaction revealed abnormalities in the cortex corresponding to the focal neurologic signs. Evidence is presented that this reaction is mediated through a vascular mechanism. (2 case reports, 4 charts.)

M. Lombardo.

### 13

#### EYEBALL AND ORBIT

Gonçalves, Paiva. Comments on a case of pulsating exophthalmos. *Rev. Brasileira de Oft.*, 1943, v. 1, June, pp. 179-191.

The patient, a young Negro, attempted suicide by firing a revolver into the right ear. Some time later he underwent a lengthy operation for extraction of fragments of the petrous portion of the right temporal bone, as well as the bullet. Four months later

the eye on the same side protruded and was congested; and a week later there was neuroparalytic keratitis and an angioneurotic edema. The eye turned inward. The visual acuity varied from nothing to one-sixth. In the course of two weeks the exophthalmos on the right side amounted to 28 mm., and the left eye developed exophthalmos of 14 mm., increasing to 24 mm. The author believes that the exophthalmos was not an indirect result of the operative interference, but arose from traumatism produced by the revolver shot. Ultimately the symptoms, which also included a bruit, were relieved by tying the internal carotid. (One photograph.)

W. H. Crisp.

Goodhill, V. Penicillin treatment of cavernous sinus thrombosis. *Jour. Amer. Med. Assoc.*, 1944, v. 125, May 6, p. 28.

In a child five years of age bilateral cavernous sinus thrombophlebitis was cured by administration of penicillin intravenously. Improvement was noted within twelve hours after institution of the treatment. Preliminary treatment with heparin and sulfathiazole had been of no avail. (3 figures.)

Robert N. Shaffer.

Kolen, A. A. A knife hook for section of the recti muscles in enucleation. *Viestnik Oft.*, 1943, v. 22, pt. 3, p. 18.

The author sharpens the inner edge of a strabismus hook, which after being introduced under the muscle shaves it off from the sclera. He claims that its use dispenses with the need for an assistant in doing an enucleation.

Ray K. Daily.

Krause, A. C., and Rosenberg, W. Treatment of metastatic meningococ-

cic endophthalmitis. *Arch. of Ophth.*, 1944, v. 32, Aug., pp. 109-112.

A girl of 18 years, with meningococcic meningitis, was admitted to the hospital on the fourth day of illness. Both corneas were cloudy and the eyes were red. Treatment consisting of administration of antimeningococcic serum and of sulfadiazine resulted in recovery from the meningitis. On the twenty-third day of the illness both eyes showed serious damage from endophthalmitis, with vision reduced to perception of hand movements at three feet. The scleras were very red. The corneas and anterior chambers were extremely hazy and the pupils were irregularly dilated and adherent to the lenses. A yellow exudate behind each lens made the details of the fundi invisible. Sulfadiazine orally and atropine sulphate locally were applied. Penicillin was administered by iontophoresis for approximately a month. Typhoid vaccine was used intravenously on two occasions.

Within three months of the onset of the disease the vision of the right eye had improved to approximately 20/30. The left retained only perception of hand movements. The right eye appeared essentially normal except for posterior synechiae and vitreous haze. The left eye was slightly softer than the right and contained a dense white mass in the pupillary space. The authors consider that sulfadiazine and penicillin were the deciding factors in the improvement in this case. A remarkable feature was that the disease had been present for 24 days without remission before improvement occurred. (References.)

John C. Long.

Sloane, H. O. Orbital cellulitis treated successfully with penicillin.

*Jour. Amer. Med. Assoc.*, 1944, v. 126, Sept., pp. 164-166.

Under the continued intravenous use of penicillin for ten days, orbital cellulitis of the left eye in a boy of 12 years cleared up completely, so that surgery upon the infected left ethmoid and maxillary antrum was unnecessary. Sulfadiazine in fairly large doses was tried without effect, and was discontinued when penicillin was begun. (2 figures.) Robert N. Shaffer.

## 14

### EYELIDS AND LACRIMAL APPARATUS

Maggi Zavalia, J., Zurbriggen, M. B., and Russo, O. Ophthalmoplegic form of myasthenia gravis. *Anales Argentinos de Oft.*, 1943, v. 4, Oct.-Nov.-Dec., pp. 143-151.

The authors consider this condition more than simply interesting, since cases of ophthalmoplegia have developed into florid myasthenias, and since, too, pharmacologic proof of an existing myasthenia can be established.

Two cases are presented. In a three-year-old male the initial symptom was sudden ptosis of the right upper lid which worsened toward the end of each day, but showed periods of remission and relapse. Complete laboratory examination yielded no abnormal findings. Temporary recovery was achieved with intramuscular prostigmine solution. An eight-year-old female showed bilateral ptosis of the upper lid, also accentuated at the end of the day: It responded to intramuscular prostigmine solution. Thus prostigmine affords pharmacologic corroboration of a suspected myasthenia gravis.

This latter disease may occur as an ophthalmoplegia, as above described, or as an amyotrophy, or in association with other syndromes. The ophthalmo-

plegic form is the most readily studied. The prognosis depends on the type of myasthenia, the ophthalmoplegic type being compatible with long life. The etiology is obscure. (2 illustrations, references.)  
Edward Saskin.

Morgenstern, D. J. Intranasal drainage for cure of chronic infection of the tear sac. *Arch. of Ophth.*, 1944, v. 32, Aug., pp. 101-103.

The author describes his technique for producing a fistula between the tear sac and the nasal cavity. A thin knife, insulated except at the tip, is passed through the dilated canaliculus into the sac and the medial wall of the sac is then incised. An inverted-U-shaped incision is made under the guidance of the palpating forefinger placed over the sac. To assure complete continuity of the U-shaped incision, the electrocoagulating current is applied to the knife. A probe is then passed through the lower canaliculus into the bottom of the tear sac and is pushed into the nasal cavity at an angle of about 45 degrees. Using this probe as a guide, the bony lacrimal fossa is broken down as widely as possible with wire hooks. Irrigation with copious amounts of fluid then turns the U-shaped flap of the sac wall down into the newly formed bony opening into the nose. Finally electrocoagulation of the newly formed opening is carried out through the nose. This method has been found satisfactory even in shrunken and sclerotic sacs. As there is a minimum of tissue destruction and usually scarcely any bleeding, the procedure can be carried out in the office. (References.)  
John C. Long.

Mutch, J. R. The lacrimation reflex. *Brit. Jour. Ophth.*, 1944, v. 28, July, 317-336.

The pathways and connections of the nerves and ganglia required for proper functioning of the lacrimation reflexes are described with diagrams. Clinical observations here reported show that the sensory or afferent pathway for reflex lacrimation is the ophthalmic division of the fifth nerve, and that the efferent pathway runs in the seventh nerve but is independent of the motor fibers of the face muscles and lies separate from the seventh nerve in the brain near the sixth nucleus and also peripheral to the geniculate ganglion. Motor impulses are shown to pass along the greater superficial petrosal nerve.

Psychic weeping is bilateral and cannot be inhibited by surface anesthesia of the conjunctiva or cornea, or by paralysis of the fifth nerve or section of the cervical sympathetic. The cervical sympathetic takes no part in reflex or psychic lacrimation. (6 figures, references.)

Edna M. Reynolds.

Reese, A. B. Partial resection of the lid and plastic repair for epithelioma and other lesions involving the margin of the lid. *Arch. of Ophth.*, 1944, v. 32, Sept., pp. 173-178.

With a series of excellent photographs and drawings, the author describes various types of operation involving halving of the lids or canthotomy with sliding of a cutaneous flap. (One reference.)

R. W. Danielson.

Silvers, S. H. *Microsporon audouini* infection of the eyelashes. *Arch. Derm. and Syph.*, 1944, v. 49, June, p. 436.

The author records the case of a white boy, 8½ years old, who had a ringworm infection of the right cheek

of about two weeks duration. Hairs of the cheek, and later some eyelashes, fluoresced under the Wood filter. Infected hairs, when removed and cultured, showed *Microsporon audouini*. At a late stage the right upper and lower lids became swollen and the conjunctiva inflamed, and under the Wood filter about one-half of the upper lashes and one third of the lower showed fluorescence. The treatment consisted of manual epilation of the infected lashes. Later examinations under the Wood filter, the first two held at weekly intervals and the last one after a month's interval, failed to show infected lashes.

Theodore M. Shapira.

Whalman, H. F. **Reconstruction of ablated lower lid.** *Arch. of Ophth.*, 1944, v. 32, July, pp. 66-67.

The method here described arose out of the necessity for extensive ablation of the lower lid in a case of basal-cell carcinoma which had grown in both directions laterally from the middle of the lower lid and had invaded the tarsal cartilage. The growth was invasive and did not subside under moderate irradiation. Since a larger dose would have resulted in destruction of the lid, excision, with a safe margin, seemed advisable. The author describes his method of transplanting a part of the upper lid to fill in the defect in the lower lid. Excellent drawings supplement the description.

R. W. Danielson.

## 15

### TUMORS

Asbury, M. K. **Epithelial tumors of the iris.** *Amer. Jour. Ophth.*, 1944, v. 27, Oct., pp. 1094-1106; also *Trans.*

*Amer. Ophth. Soc.*, 1943, v. 41, p. 368. (9 illustrations, bibliography.)

Rosén, Emanuel. **Bilateral teratoid tumor of the limbus.** *Arch. of Ophth.*, 1944, v. 32, Aug., pp. 120-122.

A man aged 25 years had noticed poor vision of the right eye and a peculiar appearance of both eyes as long as he could remember. The condition of the eyes had not undergone any appreciable change. The right eye showed a peculiar dusky injection of the bulbar conjunctiva and three hypervascularized masses. These masses were grayish, slightly elevated, and sharply outlined. They covered approximately 2 mm. of the cornea and extended into the cul-de-sac. The cornea was irregularly staphylomatous, the vision 5/200. The left eye showed two smaller and less vascularized masses similar to those observed in the right eye. The vision of the left eye was 20/20.

One of the masses, measuring 6 by 5 by 5 mm., was removed from the right eye. Microscopically the sections showed many loose adipose structures in which were many islands of lacrimal gland. Several areas of adipose tissue were intermixed with loose connective tissue. Three areas of cartilaginous tissue surrounded by a richly nuclear perichondrium were observed. An occasional bundle of nerve fibers was present. The description of several teratomatous tumors is quoted from the literature, as well as theories of causation. (One drawing, one photomicrograph.) John C. Long.

Rosen, Emanuel. **Nevus flammeus associated with conjunctival telangiectasia and possible early choroidal tumor.** *Amer. Jour. Ophth.*, 1944, v. 27, Oct., pp. 1143-1145. (4 figures.)

16

INJURIES

Brodsky, B. S. Hand magnet for removal of splinters from the eye, and some observations relative to magnet operations. *Viestnik Oft.*, 1943, v. 22, pt. 3, p. 13.

The author advocates the use of the Soviet-manufactured hand magnet in the extraction of intraocular foreign bodies. He claims that it is effective in extracting foreign bodies from the anterior ocular segment through an open anterior chamber, and is successful in diasceral extraction provided localization of the foreign body is accurate. This hand magnet is portable and independent of the electric current.

Ray K. Daily.

Brown, A. L., and Nantz, F. A. Corneal healing: adhesive power of aqueous fibrin in the rabbit. *Amer. Jour. Ophth.*, 1944, v. 27, Nov., pp. 1220-1224. (One figure, 2 tables, references.)

Campos, Evaldo. Cataract from industrial electricity. *Rev. Brasileira de Oft.*, 1944, v. 3, Sept., pp. 31-36.

A white workman aged 61 years, handling a 15,750-volt, 22-ampere transformer for conversion from a current of 220 into 110 volts, received a large electrical discharge and fell unconscious. He was found with the wire in contact with his forehead and with the left wrist adherent to the key of the transformer. He made almost complete recovery, except that he became progressively completely blind (time not stated). Each eye had total cataract, of a mother-of-pearl appearance, but with good light perception and projection. (2 figures.)

W. H. Crisp.

Ershkovich, I. G. Therapy with transplantation of preserved tissues pre-

liminary to surgical procedures in war injuries. *Viestnik Oft.*, 1943, v. 22, pt. 3, p. 19.

With a report of cases the author demonstrates the beneficial effect on traumatic iridocyclitis of transplantation of small segments of preserved placenta into the skin of the mastoid. In one case the procedure arrested the development of a secondary glaucoma, and the eye tolerated a subsequent iridectomy which normalized the intraocular tension and improved visual acuity to .03. In another case of traumatic iridocyclitis, with iris bombé and occlusion of the pupil, the effect of the preserved placenta was to save the eye from enucleation. The author credits this form of therapy with the favorable course of iridectomies and lens extractions following severe traumatic iridocyclitis. Poor light projection becoming normal after transplantation served as indication for iridectomy or cataract extraction which resulted in further improvement in visual acuity.

Ray K. Daily.

Karandasheva, K. M. Perforating ocular injuries in the material of the N Hospital. *Viestnik Oft.*, 1943, v. 22, pt. 3, p. 24.

In this special army hospital perforating injuries occurred in 41 percent of the cases, 96 percent of them being caused by fragments of mines, bombs, or grenades and 4 percent by bullets. In 17 percent of the cases both eyes were injured. In 40 percent there was total loss of vision in one eye. In 37 percent foreign bodies were found within the eye and 16 percent in the orbit. No hair or wool particles were found with the foreign bodies, even at enucleation. The lids were injured in 35 percent of the cases, the cornea in 11.5 percent, the conjunctiva in 5.5



percent, the sclera in 13.5 percent, and the eyeball was completely destroyed in 35 percent. Perforating scleral injuries were found in 35 percent of the cases. Ophthalmoscopy was possible in 27 percent of the cases. The average hospitalization time was 9 to 11 days. Eye injuries should be seen by an ophthalmologist within the first one or two days. Results were better in the injured who reached the hospital within the first 24 to 36 hours. Soldiers with eye and orbital injuries should be evacuated in the recumbent position.

Ray K. Daily.

Katznelson, A. B. Remarks on conjunctival plastic procedures in war injuries of the cornea. *Viestnik Oft.*, 1943, v. 22, pt. 3, p. 11.

The author disparages the use of the Kuhnt conjunctival flap in corneal injuries, preferring corneal sutures, which in his experience result in more accurately coapted edges, and better protection of the uvea. The conjunctival flap is suitable for extensive scleral and corneoscleral wounds with prolapse of uveal tissue. Gaping scleral wounds should be sutured. Ray K. Daily.

Krasnov, M. L. Clinical evaluation of hand magnets made of iron, nickel, and aluminum alloy. *Viestnik Oft.*, 1943, v. 22, pt. 3, p. 15.

On the basis of experience in one hundred cases, the author concludes that the nonelectric hand-magnet is inadequate for magnet extraction of intraocular foreign bodies, and is inferior to the electromagnet. He believes that a giant magnet is an essential equipment of an ophthalmologist attempting magnet extraction. Ray K. Daily.

Krol, A. G. A case of traumatic retinal angiopathy with recovery, fol-

lowing compression of the chest. *Viestnik Oft.*, 1943, v. 22, pt. 3, p. 27.

During explosion of an aerial bomb, a soldier suffered a blow on the chest and arm and a fracture of the left clavicle. He remained unconscious for a day. Three days after the injury he noticed impairment of vision. The eyes were examined 17 days later. In the left fundus were several edematous areas with small hemorrhages, similar to the type described by Purtscher in skull injuries. The eye recovered. The author suggests that ocular examination be made in all cases of chest injury. Ray K. Daily.

Lijó Pavia, J. Blood disc of the cornea. *Rev. Oto-Neuro-Oft.*, 1944, v. 19, March-April, pp. 41-52.

Blood staining is an infrequent complication of contused and penetrating wounds of the cornea. It was first reported in the literature in 1509. The author reports the case history of an 8-year-old girl who received a severe direct blow to her left eye resulting in "hemophthalmos." After absorption of the blood a hematic disc was observed in the center of the cornea, extending beyond the pupillary space. The disc was reddish with a dark border. Biomicroscopic study and color photography placed the disc in Descemet's membrane and the parenchyma. Diminution in size and density of this opacity was achieved by phototherapy, using red-free light.

In his discussion the author differentiates between corneal contusion and luxation of the lens into the anterior chamber, the former being associated with corneal hyposensitivity, oscillating intraocular tension, and blood-staining of the cornea. The blood stain usually lasts months or even years.

Edward Saskin.

Ochapovskaja, D. Hemotherapy in burns of the eyes and keratitis. *Viestnik Oft.*, 1943, v. 22, pt. 3, p. 45.

Ochapovskaja is very enthusiastic about her method of therapy, the principal feature of which is the frequent instillation into the conjunctival sac of the patient's defibrinated blood; the cornea is thus nourished by plasma, and is provided with oxygen by the erythrocytes. In addition the blood exerts a favorable action by its content of numerous immune bodies and ferments, and it restores the normal pH disturbed by the burn. Immediately after the burn the eyeball is irrigated profusely to eliminate whatever of the offending chemical is left, and necrotic tissue is curetted away. Hemotherapy is instituted immediately, and fine adhesions between the eyeball and the lids are separated twice daily to prevent synechia. Under this régime the corneal epithelium regenerates in from two to six days. Ray K. Daily.

Pendergast, J. J. Routine eye-treatment technique. *Industrial Medicine*, 1944, v. 13, Aug., p. 604.

The author describes the standard ophthalmic procedure developed in the various plants of the Chrysler Corporation. Great care is taken for sterile action. Not only do nurses remove superficial foreign bodies with a tooth-pick applicator but as a war-time measure they remove embedded foreign bodies with a spud. Acid and alkali burns are to be washed with a copious amount of saline solution. If the cornea stains with fluorescein the patient must be seen by an oculist. Flash burns are treated with pontocaine and adrenalin. R. Grunfeld.

Rabinowicz, W. G. Military plastic surgery in ophthalmology. *Viestnik Ophth.*, 1943, v. 22, pt. 3, p. 3.

The variety of injuries about the orbit requires a versatility and individualization in surgery needed in no other region. The qualifications of an ophthalmologist doing plastic surgery are initiative, imagination, creativeness, ability to deviate from a previously prepared plan, and improvisation. He should be thoroughly acquainted with the anatomy and physiology of his surgical field. He should have a meticulously prepared plan of operative procedure, and he should be able to visualize the desired surgical result. He should choose the simplest procedure which will attain the desired objective within the shortest possible time, and which will insure restoration of anatomic form and function; and which, in case of failure, will not make further operative interference difficult by excessive destruction of tissue. He should possess a sense of form and be somewhat of an artist.

The author uses pedicle flaps and free transplants. The plastic procedures used are principally those of Imre. (Illustrations.) Ray K. Daily.

Sherman, A. R. The application of Guist's localizing instrument in the extraction of intraocular foreign bodies by the posterior route. *Amer. Jour. Ophth.*, 1944, v. 27, Oct., p. 1149. (1 figure.)

Siegel, Ralph. Buccal mucous membrane grafts in treatment of burns of the eye. *Arch. of Ophth.*, 1944, v. 32, Aug., pp. 104-108.

The treatment of severe chemical burns in eight patients is described. Seven of the patients were Negroes. In the order of their severity, the agents causing the burns in this series of cases were lye, gasoline, sulphuric acid, and lime. Five of the patients were treated

by prompt mucous-membrane grafts to the bulbar conjunctiva. The end results illustrate the value of the grafting. The author states that grafting should be performed in cases of burns of the eye of the following types: (1) direct burn of the cornea with a perilimbal circulation; (2) direct burn of the cornea with a perilimbal circulation of questionable integrity; (3) burn of the bulb with local destruction of the perilimbal circulation but unaccompanied by corneal involvement.

Immediate grafting stimulates vascularization, which helps restore corneal nutrition, with early return of functional power. This procedure also prevents the formation of scar tissue with symblepharon. If grafting is done too late or is omitted, local anoxemia leads to infiltration of the cornea, with leukoma and other sequelae. A porcelain-white sclera after a burn offers a grave prognosis unless grafting is promptly done. Even so, the damage may be so great that the eye goes on to corneal perforation. Except in those cases where the perilimbal circulation is totally destroyed, early grafting not only shortens the course of the healing process but offers a better prognosis. The technique of the operative procedure is given. (8 color photographs, references.) John C. Long.

Smelser, G. K., and Ozanics, V. **Effect of chemotherapeutic agents on cell division and healing of corneal burns and abrasions in the rat.** *Amer. Jour. Ophth.*, 1944, v. 27, Oct., pp. 1063-1072. (6 figures, references.)

Sobol, I. M. **War injuries of the nasal sinuses and their treatment.** *Viestnik Oft.*, 1943, v. 22, pt. 3, p. 28.

Injuries of the nasal sinuses are frequent and may be accompanied by

various ocular complications. Constriction in the visual field or a disturbance in color vision may be overlooked. More frequently, there is edema about the orbit accompanied by displacement of the eyeball forward or forward and outward, rapid loss of vision, headache, and septic temperature. The diagnosis of involvement of the sphenoid sinuses is difficult even with detailed roentgenographic study. The author's material shows that frequently the dominating clinical factor is not the trauma to the sphenoid sinuses but the character and extent of the secondary inflammatory phenomena, and it is these symptoms which determine the type of treatment. In firearm injuries of face and orbit the possibility of injury to the sinuses should be kept in mind, and roentgenograms taken in several positions are obligatory. Treatment has to be individualized, depending on the symptoms. Only fundus changes, extension of inflammatory phenomena in the soft orbital tissues, and meningeal symptoms should be considered indications for early operative interference.

Ray K. Daily.

Spaeth, E. B. **Removal of metallic foreign bodies from the eyeball and from the orbit.** *Proc. Interstate Postgrad. Med. Assoc. North America*, 1943, p. 52.

The eye must have retained some degree of vision if one is to attempt to remove an intraocular foreign body. The iris and the ciliary body must not be too severely damaged. When in doubt it is a wise rule to enucleate. X-ray localization is discussed, including in borderline cases the injection of air into Tenon's capsule to decide whether the foreign body is intraocular. The author discusses the choice of cases for giant magnet and hand

magnet respectively; and extraction behind the equator, with avoidance of vortex veins and followed by scleral suture. In cases of nonmagnetic foreign body, radiopaque landmarks permit flap sclerotomy and extraction. When the vitreous is clear the endoscope and specially shaped forceps for grasping the foreign body may be resorted to. In other cases the biplane fluoroscope technique has to be used.

R. Grunfeld.

Trevor-Roper, P. D. The late results of removal of intraocular foreign bodies with the magnet. *Brit. Jour. Opth.*, 1944, v. 28, July, pp. 361-365.

A review of 154 cases in which a magnetic foreign body was successfully removed from the eye is given. The cases were treated at Moorfields Hospital during the first four years of the war. In only two cases was the posterior route used. One eye became shrunken and sclerotic and the other required enucleation. Removal through the scleral wound of entry was done in two cases. In both of these vision was reduced, one from a localized cataract and the other from macular striae. In the remaining 150 cases, the anterior route was employed.

Two thirds of the cases without lens injury retained good vision. The lens was injured in two thirds of the cases, but in 14 percent of these the cataract was localized enough to allow reading vision. Delay in removing the foreign body was shown to be of little consequence. Corneal wounds had a better prognosis than limbal or scleral wounds in the ciliary region. Cases without uveal damage showed a much smaller reduction of vision than cases complicated by iris or ciliary prolapse.

The strengths of the magnetic fields from various magnet tips have been

estimated and are given in tabular form.  
Edna M. Reynolds.

Tumarkina, M. Late result of a severe ocular injury. *Viestnik Oft.*, 1943, v. 22, pt. 3, p. 46.

A student had his only eye injured by a powder explosion. When he arrived at the Helmholtz Hospital three weeks later, there was powder embedded in his lids, cornea, and conjunctiva. There was an opacity in the lens, and the vitreous was cloudy. Light projection was defective. Repeated examinations revealed dense vitreous opacities, which in places appeared as yellow membranes. The patient was deeply disturbed emotionally by the prospect of blindness, and after a month in the hospital he left with good light projection except nasally, where it was doubtful. His family was given a poor prognosis. The patient, however, began to improve, and within three years his visual acuity rose to 0.5, as the vitreous became clearer. As the fundus became visible a large yellowish-white focus surrounded by pigment was seen in the upper inner periphery; from this focus fine membranes extended into the vitreous. Such a recovery in an apparently hopeless case, while very rare, should nevertheless make us cautious in giving a poor prognosis even in grave cases.

Ray K. Daily.

## 17

### SYSTEMIC DISEASES AND PARASITES

Maggi Zavalia, J., Zurbriggen, M. B., and Russo, O. Ophthalmoplegic form of myasthenia gravis. *Anales Argentinos de Oft.*, 1943, v. 4, Oct.-Nov.-Dec., pp. 143-151. (See Section 14, Eyelids and lacrimal apparatus.)

Pacheco-Luna, R. **Guatemalan onchocercosis.** *Ophth. Ibero Amer.*, 1944, v. 5, no. 4, pp. 345-347 (in Portuguese); pp. 347-350 (in English).

The disease, discovered in Guatemala in 1915 by Robles, is endemic in the rich coffee-bearing zones of the Western slope of the Guatemalan Andes, and in neighboring parts of Mexico. The filaria lives inside of fibrous tumors, which may reach the size of a dove's egg. The microfilarias emigrate outside the tumors.

Transmission of the organism is effected by means of flies of the genus *Simulides*. The number of persons attacked in Guatemala is estimated at 20,000, 2 percent of the inhabitants of the endemic zones being blind. The onset of ocular invasion is announced by intense photophobia, blepharospasm, and a sense of foreign body. There is no medicinal specific. Simple extirpation of the tumors is the principal treatment, but it has no effect on the microfilarias, which continue to live for an appreciable length of time.

W. H. Crisp.

## 18

### HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Awerbach, M. I. **The first twenty-five years of Soviet ophthalmology.** *Viestnik Oft.*, 1942, v. 21, pt. 6, p. 3.

In this article the dean of Russian ophthalmologists reviews the advances in ophthalmology during the last 25 years, and the contributions of Russian ophthalmologists. Outstanding is the development of synthetic substitutes for cocaine, which practically eliminated general anesthesia in ophthalmic surgery in adults. Corneal transplantation has become effective and feasible

since the utilization of preserved cadaver cornea was introduced by Filatov. The six thousand dacryocystorhinostomies performed at the Helmholtz Institute demonstrate that there are no contraindications to this operation. Extirpation of the lacrimal sac leaves a soldier disabled for service, while dacryocystorhinostomy permits him to return to active duty. Present investigations are concentrated in the field of plastic surgery on the lids and adjacent structures. The war did not interrupt the program of Soviet ophthalmology, but it directed research into the field of prophylaxis and treatment of war injuries. *Ray K. Daily.*

Crisp, W. H. **Pitfalls of the general physician in ocular diagnosis.** *Rocky Mountain Med. Jour.*, 1944, v. 41, Sept., pp. 626-633.

The author decries the attitude of some general practitioners who believe that they should not or could not learn more about the eye than they already know, and the attitude of others who keep too long a case which ought to be sent to an ophthalmologist. Every physician should know something about the anatomy and physiology of the eye, and about the principles of refraction. He should be familiar with simple methods of eye examination, for instance oblique illumination and taking tension with the fingers; and also with the use of the ophthalmoscope. He should be able to differentiate a normal from a pathologic fundus picture, and between iritis and glaucoma. He should know that marked optical defects may cause cross eye, and that this may be commonly overcome in earlier life by corrective lenses. The general physician can get this information by careful

reading and by diligent attendance at an eye clinic. R. Grunfeld.

Gradle, H. S. *The Pan-American Congress of Ophthalmology*. *Ophth. Ibero Amer.*, 1944, v. 5, no. 4, pp. 350-364.

This, translated into Portuguese, is the material which was published in English in the *Transactions of the American Academy of Ophthalmology and Otolaryngology*, 1943, October, p. 35.

Pérez Porcel, Enrique. *Trachoma in Bolivia*. *Arch. de Oft. de Buenos Aires*, 1942, v. 17, Oct., p. 605.

Bolivia is fortunate in having no trachoma problem. The rare cases observed are found in immigrants, and the native population is free from this scourge, in spite of the poverty, ignorance of elementary hygienic practices, and undernourishment of the lower classes. Analyzing the factors which make the country trachoma-free, the author discusses, among others, the following: small foreign immigration in comparison with the countries on the seaboard; inland geographic situation, with reduced population and few means of communication; population centers situated at an altitude of over 2,500 meters above sea level, with the unquestionably beneficial influence of climatic conditions. (References.)

Plinio Montalván.

Post, L. T., and Slaughter, H. C. *National ophthalmological societies in the United States*. *Amer. Jour. Ophth.*, 1944, v. 27, Nov., pp. 1225-1228.

Savvaitov, A. C. *Ophthalmic services during the last twenty-five years*. *Viestnik Ophth.*, 1942, v. 21, pt. 6, p. 17.

Before the Soviet Revolution, Russia headed the list of European countries in the percentage of blindness. It had about three hundred ophthalmologists living mostly in large cities, and a total of two thousand ophthalmic beds. It had no public-health service. In 1918 the newly organized Public Health Service prepared a program of care and prophylaxis. In 1920 the ophthalmic division of the Public Health Service developed its program. As a result the number of ophthalmic beds today exceeds eight thousand, and the number of ophthalmologists exceeds two thousand. The number of graduate ophthalmic clinics increased from 11 to 35. Eleven trachoma dispensaries were opened, and almost eight thousand rural clinics and thirty-five hundred trachoma stations were established. Six eye institutes and six trachoma institutes were built, and large ophthalmic sections were opened in all large hospitals. The Helmholtz Institute in Moscow is pursuing research in retinal detachment, diasceral extraction of foreign bodies, and dacryocystorhinostomy. The Institute of Experimental Ophthalmology was devoted chiefly to corneal transplantation. The Ukraine Institute is investigating color vision and glaucoma, and the construction of ophthalmic apparatus. The prophylactic section issued numbers of leaflets, placards, exhibitions, and films for use in schools and industries and on farms. As a result the incidence of trachoma fell significantly. Ophthalmia neonatorum diminished, and blindness from smallpox was eliminated. Syphilis of the eyes is becoming rare, and complications of infectious diseases of childhood are becoming fewer. When Russia was attacked by Germany in 1941, the ophthalmic efforts were diverted

toward organization of an efficient ophthalmic service at all points of military evacuation, provision of services for evacuated civil populations, and the management of epidemics, particularly among children deprived of vitamins through confiscation of all dairy products by the Germans. Ray K. Daily.

Savvaitov, A. C. The struggle against trachoma for the last twenty-five years. *Viestnik Oft.*, 1942, v. 21, pt. 6, p. 22.

In Czarist Russia trachoma was very prevalent, especially among the rural population and particularly among foreigners, who were treated as colonials and had no provision for education, culture, sanitation, or medical services. The enfranchisement of foreigners, as well as of women, came with the Social Revolution. During the first years after the Revolution all medical services were attached to the Red Army. In 1922 the Trachoma Institute was opened at Kazan, as a part of the program in the struggle with trachoma. This struggle was carried on through a network of trachoma stations reaching into all trachoma areas, and through the training of specialized personnel. The program was interrupted by the war, but is to be resumed at its conclusion. Ray K. Daily.

Sená, J. A. Evaluation of workmen's disability from partial loss of vision of one eye. *Arch. de Oft. de Buenos Aires*, 1942, v. 17, Nov., p. 697.

The evaluation of disability from partial loss of vision of one eye must be proportionate to the visual loss sustained. The notations for visual acuity do not constitute fractions of vision. Applying to the Argentine workmen's compensation laws the percentages of

visual efficiency derived from the experimental, clinical, and mathematic researches of Snell and Sterling, approved by the American Medical Association, values are obtained which correspond very closely to those arrived at by the author to determine the disability from partial loss of vision of one eye when the other eye is normal. (Tables.) Plinio Montalván.

Sorsby, Arnold. Trachoma in London: the end of a chapter. *Brit. Med. Jour.*, 1944, Aug. 12, p. 220.

In May, 1944, the last five remaining children in the trachoma block at White Oak Hospital were discharged and the block closed down. Formerly, poor hygienic conditions and rudimentary medical facilities made trachoma and other infections endemic in Poor Law institutions. The need for effective isolation and treatment was pressed upon the authorities, with the result that two ophthalmic hospital-schools were erected. The other hospital school became superfluous in 1918. The numbers of admissions to the White Oak Hospital were as follows: In 1903, 292; between 1904 and 1913, a yearly average of 112; during the next decade, 29; the following decade, 34; and in the last decade an average of 13 yearly admissions.

Trachoma is still not infrequent in London and remains a potential source of epidemic. Early and persistent treatment is essential. As indicative of what can be achieved by systematized and persistent effort the experience at Glasgow is quoted. Notification is compulsory. Systematic treatment in the trachoma clinic and examination of contacts are carried out, and provision is made for hospitalization of adults and children who need it. The number of

new cases in Glasgow in 1915 was 112; in 1925, 41; in 1935, 18; and in 1943, 3.

R. Grunfeld.

## 19

### ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Haden, H. C. Concerning the relations of the developing optic nerve to the recessus opticus and the hypophysis in young fetuses: a study of seven human fetuses 4 mm. to 40 mm. inclusive. *Amer. Jour. Ophth.*, 1944, v. 27, Oct., part 2, pp. 1-44. (41 illustrations, references.)

Semeraro, Edmundo. Contribution to anatomic study of the eyeball. *Rev. Brasileira de Oft.*, 1943, v. 1, June, pp. 209-212.

The author describes the variations which he has encountered post mortem, in the structure of Tenon's capsule. Sometimes there are strong adhesions of the capsule to the fatty tissue and the ocular muscles. Sometimes such adhesions are absent. Sometimes Tenon's capsule seems to have undergone complete atrophy and disappearance. Some brief comments are offered as to the effect of these variations on surgical principle. (2 illustrations.)

W. H. Crisp.

Van Harreveld, A. Oxygen consumption of degenerated optic nerves. *Proc. Soc. Exper. Biol. and Med.*, 1944, v. 56, June, p. 192.

The author takes issue with a report of increase in oxygen consumption of degenerated human optic nerves (Michail and Benetato, *Soc. Biol.*; Paris, 1936, v. 121, p. 267.)

To support his contention the author severed the optic nerves of one eye in

each of six cats, and six months later removed the nerves and compared the oxygen consumption. In two cases the degenerated nerve had slightly higher metabolism, in the other four it was lower, the average favoring the normal nerves. It is suggested that the previous observations may have been in error because the nerves were minced, thereby reducing their oxygen utilization. Benjamin Milder.

Vidal, F., and Malbrán, J. L. Arrangement of the myelin fibers in the chiasm of the cat. *Arch. de Oft. de Buenos Aires*, 1942, v. 17, Nov., p. 684.

Of a series of 20 cats, one or both eyes were enucleated in some and retinal microlesions were produced in others. The cats were allowed to live from nine days to ten months. The chiasms were studied following cresyl-violet, Weil, and Marchi techniques. From this experimental work it can be stated that in the cat no retinal fiber ends in the hypothalamus. The number of crossed fibers in the chiasm is larger than of uncrossed; the former occupy the rostral portion of this structure and the external border of its posterior half, while the latter run along the lateral borders of the anterior half of the chiasm and the ventral portion of the posterior half, where they mingle with the crossed fibers. The septohypothalamic fibers are found in the rostral and dorsal portions of the chiasm. The fibers of the ventral supraoptic commissure or commissure of Gudden invade the posterior third of the chiasm, forming its posterior border. The fibers of the ventral geniculate body are situated in the caudal and ventral portions of the commissure of Gudden. The fibers of the supraoptic dorsal commissure or commissure of Meynert



occupy the rostral portion of the medial hypothalamus and the fibers of the supraoptic dorsal commissure or commissure of Ganser are situated in the dorsal part of the medial hypothalamus. (Photomicrographs, references.)  
Plinio Montalván.

Vidal, F., and Malbrán, J. L. Arrangement of the superior homolateral optic fibers in the cat. *Arch. de Oft. de Buenos Aires*, 1942, v. 17, Oct., p. 626.

In this experimental work the authors employ the same technical procedure described in a previous paper (*Amer. Jour. Ophth.*, 1944, v. 27, p.

1058) concerning the inferior peripheral homolateral fibers in the cat, producing first a retinal microlesion and studying the direction and extent of the ensuing degenerative changes throughout the primary optic tract. From the present work they show that the superior homolateral fibers have a superior or dorsal arrangement in relation to the inferior peripheral homolateral fibers. They also prove that the fibers first run on the external aspect of the tract, taking a medial position when they reach the dorsal geniculate body. (Photomicrographs.)

Plinio Montalván.

# NEWS ITEMS

Edited by DR. DONALD J. LYLE  
904 Carew Tower, Cincinnati 2

News items should reach the editor by the twelfth of the month.

## DEATHS

Dr. Joseph T. Auwers, Grand Rapids, Michigan, died September 12, 1944, aged 59 years.

Mr. William Bausch, Bausch and Lomb Optical Company, Rochester, New York, died October 19, 1944, aged 83 years.

Dr. J. A. Biever, Mount Joy, Pennsylvania, died August 27, 1944, aged 86 years.

Dr. Howard Black, Palo Alto, California, died September 21, 1944, aged 70 years.

Dr. William K. Campbell, Long Branch, New Jersey, died September 21, 1944, aged 65 years.

Dr. Charles H. Crain, Evanston, Illinois, died September 29, 1944, aged 89 years.

Dr. Richard S. Crichlow, New Orleans, Louisiana, died September 18, 1944, aged 62 years.

Dr. William E. Joiner, Seattle, Washington, died August 7, 1944, aged 74 years.

Dr. Robert H. Kistler, Lansford, Pennsylvania, died October 4, 1944, aged 55 years.

Dr. Arnaud J. LaPierre, Norwich, Connecticut, died July 12, 1944, aged 59 years.

Dr. Archibald C. Lewis, Memphis, Tennessee, died September 18, 1944, aged 67 years.

Dr. Daniel J. Maloney, Waterbury, Connecticut, died August 4, 1944, aged 77 years.

Dr. Benjamin F. Matheny, Parsons, West Virginia, died September 8, 1944, aged 65 years.

Dr. Hugh S. McKeown, New York, New York, died September 14, 1944, aged 49 years.

Dr. Elmer E. Owen, Batavia, New York, died August 2, 1944, aged 62 years.

Dr. Joseph W. Robinson, Lisbon, Ohio, died September 21, 1944, aged 50 years.

Dr. Charles M. Rosenthal, Brooklyn, New York, died September 1, 1944, aged 35 years.

Dr. Olaf H. Rystad, Grand Forks, North Dakota, died August 16, 1944, aged 68 years.

Dr. Frederick A. Smith, Troy, New York, died August 7, 1944, aged 76 years.

Dr. Henry D. Smith, Sanford, Florida, died August 12, 1944, aged 54 years.

Dr. Louie L. Steiner, Danville, Illinois, died August 17, 1944, aged 65 years.

Dr. Harry J. Stewart, San Diego, California, died October 31, 1944, aged 76 years.

Dr. James Thorington, Philadelphia, Pennsylvania, died October 27, 1944, aged 86 years.

Dr. William F. Waggoner, Carrollton, Illinois, died July 14, 1944, aged 77 years.

Dr. Edwin D. Watkins, Memphis, Tennessee, died July 31, 1944, aged 62 years.

Dr. Cephas J. Wells, Bartlesville, Oklahoma, died September 9, 1944, aged 79 years.

Dr. John E. Virden, New York, New York, died August 30, 1944, aged 81 years.

## MISCELLANEOUS

A six-month course for orthoptic technicians will be given by The George Washington University School of Medicine, Washington, D.C., beginning February 5, 1945. Trainees must be sponsored by certified ophthalmologists. The fee for the course is \$250.00. For further details write to Dr. Ernest Sheppard, School for Orthoptic Training, The George Washington University School of Medicine, 1335 H Street, N.W., Washington 5, D.C.

An orthoptic clinic has been established at the James Whitcomb Riley Hospital for Children at Indianapolis to provide special training for children who have difficulty in eye focusing and to supplement surgery for correction of strabismus.

## SOCIETIES

The Washington, D.C., Ophthalmological Society elected the following officers for the 1944-1945 season: Dr. Harold R. Downey, president; Dr. John R. Lloyd, vice-president; and Dr. Richard W. Wilkinson, secretary-treasurer.

The officers of the Milwaukee Oto-Ophthalmic Society for 1944-1945 are: Dr. Leon H. Guerin, president; Dr. Ralph T. Rank, vice-president; and Dr. Frank G. Treskow, secretary-treasurer.

At the meeting of the Eastern Pennsylvania Association of Eye, Ear, Nose, and Throat Physicians in Wilkes-Barre on May 10, 1944, it was unanimously decided to change the name of that organization to the Pennsylvania Academy of Ophthalmology and Otolaryngology.

The following officers were elected: Dr. Lewis T. Buckman, president; Dr. Roy Deck, first vice-president; Dr. M. M. Rosenberg, second vice-president; Dr. Daniel S. DeStio, third vice-president; Licut. Comdr. Sterling F. Mengel (MC) U.S.N. (on active duty), secretary; Dr. Paul C. Craig, secretary pro tem; and Dr. James J. Monahan, treasurer.

The scientific program consisted of the following papers: "Dentigerous cyst" by Dr.

Thomas R. Gagon; "Anatomy of middle ear and mastoid" by Dr. Horace J. Williams; "Neuropsychiatric aspects of ophthalmology and otolaryngology" by Dr. L. Vosburgh Lyons; "Ocular infections" by Dr. Isadore Givner; and "Sinusitis" by Dr. Blakc F. Donaldson.

At the forty-ninth annual meeting of the Seaboard Medical Association of Virginia and North Carolina, December 5th to 7th, Dr. Antonio A. Burke, Norfolk, Virginia, presented a paper on "Glaucoma with especial relation to early treatment."

The second annual clinical conference of the Chicago Medical Society will be held from February 27th to March 1st at the Palmer House in Chicago. Dr. Peter C. Kronfeld, Chicago, will be among the guest speakers.

At the meeting of the Washington, D.C., Ophthalmological Society on November 6, 1944, Dr. Frank Walsh of Baltimore, the guest speaker, discussed "Some syphilitic involvements of the optic nerve." Dr. James S. Dryden reported a case, entitled "Glaucoma, acute, secondary to luxated intumescent lens." The following case presentations were made: "Detachment of the retina" by Dr. Sterling Bockoven; "Fractured skull with bitemporal hemianopia" by Dr. Joseph Dessoiff; "A case of tuberculous choroiditis" by Dr. Thomas A. Egan; "An ocular myasthenia gravis" by Dr. Dorothy B. Holmes; "Complete central blindness of unknown cause" by Dr. Thomas R. Rees; and "Tear in Descemet's membrane" and "Gonorrheal conjunctivitis in adult treated with penicillin" by Dr. Roy A. Stewart.

At the regular monthly meeting of the Milwaukee Oto-Ophthalmic Society, held jointly with the Milwaukee Academy of Medicine on December 19th, Dr. James Watson White, New York, conducted an all-day course on "Ocular muscles."

The Dallas Southern Clinical Society will hold its fifteenth annual Spring Clinical Conference, March 19-22, 1945. Among the guest speakers will be Dr. Edmund B. Spaeth, Philadelphia.

#### PERSONALS

Major Middleton E. Randolph (MC), Chief of the Ophthalmology Branch, Surgical Consultants Division, Office of the Surgeon General, has been assigned liaison officer with the Committee on Sensory Devices, Office of Scientific Research and Development, it has been recently announced.

The Cleveland Community Fund presented Drs. Charles I. Thomas and William E. Bruner with the distinguished service award for outstanding work in the field of sight restoration.

On November 24th, the Saint Louis Ophthalmic Society gave a dinner in honor of two of its members, Dr. John Green and Dr. Lawrence T. Post, past presidents, respectively, of the American Ophthalmological Society and the American Academy of Ophthalmology and Otolaryngology. About 50 members and guests were present. Dr. Frederick E. Woodruff read a paper on, "The history of ophthalmology in Saint Louis."

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### ABSTRACTS

General methods of diagnosis; Therapeutics and operations; Physiologic optics, refraction, and color vision; Ocular movements; Conjunctiva; Cornea and sclera; Uveal tract, sympathetic disease, and aqueous humor; Glaucoma and ocular tension; Crystalline lens; Retina and vitreous; Visual tracts and centers; Eyeball and orbit; Eyelids and lacrimal apparatus .....	217
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FIG. 1 (FRALICK), RUBEOSIS IRIDIS DIABETICA

## RUBEOSIS IRIDIS DIABETICA\*

F. BRUCE FRALICK, M.D.

*Ann Arbor, Michigan*

Rubeosis iridis diabetica is the term given by Salus<sup>1</sup> to signify the presence of new-formed blood vessels in the sphincter region of the anterior surface of the iris. He rightly believed that he was dealing with a syndrome not previously described, since the condition was observed bilaterally in three diabetic patients, all eventually showing glaucoma. Thirty-two case reports, including those of his three patients, showing rubeosis of the iris in association with diabetes have appeared in the literature.

Salus emphasized that "rubeosis iridis is not rare, as it is frequently seen in its minor degrees but only occasionally in a well-defined manner." He called it "a second diabetic iris change," the first being black aqueous from hydroptic degeneration of the posterior iris epithelium. Salus's original description bears repetition despite the accumulation of additional information concerning rubeosis iridis since his communication was published:

"The normal iris is covered by radially arranged groups of light-red capillary nets which are placed closely together. They are connected by thicker, shorter, and horizontally running small vessels. These groups of vessels end in the vicinity of the pupil at the pigment margin without extending over it. They terminate at the ciliary end of the pupillary region so that their utmost ends cover it but they do not extend over its margin to any considerable degree. Thus, the whole pupillary part of the iris is covered by a dense net of chiefly radially running capillaries; it acquires a rose-red tinge,

particularly striking in a blue iris, which ends suddenly at the ciliary border. Starting at the capillary net, there are more or less numerous larger light-red vessels in irregular curves spreading over the iris and disappearing in the angle of the anterior chamber. They collapse if one presses upon the corresponding part of the limbus and are filled again from the side of the iris after pressure is discontinued."

At first, Salus was under the impression that the iris condition which he described was somehow caused by glaucoma, probably through venous stasis. Waite and Beetham<sup>2</sup> were of the opinion that rubeosis was a sequel to hemorrhagic glaucoma, not uncommon in diabetics, rather than a sequel to diabetes itself, in their excellent investigation of ocular complications found in 2,002 consecutive diabetic patients. Salus, however, after observing rubeosis iridis in two eyes not manifesting glaucoma for two and five years, respectively, reversed his impressions. This observation has been substantiated by Gil,<sup>3</sup> v. Sallmann,<sup>4</sup> Motolese,<sup>5</sup> Gallino,<sup>6</sup> and Fehrmann.<sup>7</sup> Thus, it may quite definitely be accepted that it is the vascular proliferation on the iris that eventually leads to glaucoma. Credit should therefore also be given to Salus for first suggesting that the capillary changes of the iris precipitated the glaucoma and that differentiation be made between the usual primary glaucoma and the type manifesting rubeosis iridis in the eye of diabetics.

Following Salus's observations, but without adding significantly to the knowl-

\* Candidate's thesis accepted by the American Ophthalmological Society, June, 1944.



edge of rubeosis iridis, Axenfeld,<sup>8</sup> Arruga,<sup>9</sup> Waldstein,<sup>10</sup> Lawrence and Levy,<sup>11</sup> Gallino,<sup>6</sup> and Motolese<sup>5</sup> reported similar eye conditions. The gonioscopic and pathologic findings of an eye showing rubeosis iridis and glaucoma in a diabetic individual was first described by Kurz<sup>12</sup> in 1937. Salus's conception of the cause of glaucoma in these eyes was confirmed and further elaborated by these findings.

By gonioscopic examination Kurz found that the chamber angle was bridged here and there by peripheral synechiae of varying width, and that the iris surface in the region of the anterior synechiae were elevated, giving the iris "the appearance of corrugated iron." He described large newly developed vessels on the iris ridges. Clumps or knots of fine vessels quite similar to, but not tending to be so diffusely disposed as those seen in the sphincter region, were noted in the valleys between the ridges. In this instance, Schlemm's canal was filled with blood and seemed to be directly connected with the vascular proliferation in the region of the anterior synechiae. Kurz described innumerable delicate vascular loops forming nets which run from the surface of the iris up over and partially covering the corneoscleral trabeculum. These changes advanced as time elapsed, and caused the crest of the iris waves to become higher and broader until the entire circumference of the chamber was finally filled with the adhesion.

In another significant observation in connection with rubeosis iridis, Kurz found that the vascular net in a rubeotic eye disappeared with the development of iris atrophy. Therefore, as these eyes go into absolute glaucoma they might not show evidence of a previously existing rubeosis iridis. This fact was beautifully demonstrated in two patients presented by Motolese. Both of his patients had one absolute glaucomatous eye without rube-

osis, and both had rubeosis but as yet no glaucoma in the other eye.

The slitlamp and gonioscopic findings were confirmed by Kurz in pathologic studies of a rubeotic eye. The changes in the iris consisted of extensive proliferation of the vessels in the sphincter and ciliary regions accompanied by extensive extravasations. No similar vessel proliferations were noted in the ciliary body. It is hard to conjecture just why the anterior surface of the iris should be selected as the site of this peculiar vessel proliferation in diabetic and nondiabetic rubeosis. It has not as yet been determined whether there are differences in the aqueous of diabetics with and without rubeosis. Rubeotic eyes examined pathologically have not shown significant vascular changes in the ciliary processes to confirm the theory that degenerative vascular changes in the presence of diabetes might so alter the metabolic constituents of the aqueous as to bring about vascular proliferation on the iris surface in the regions of the greater and lesser arterial circles. Hemorrhagic retinopathy and a tendency to vascular proliferations in and on the retina and optic nerve were noted by Kurz,<sup>12</sup> and later by Favaloro,<sup>13</sup> Fehrmann,<sup>7</sup> and Sugar<sup>14</sup> in pathologic examinations of rubeotic eyes.

Two cases presenting the clinical picture of rubeosis in the absence of diabetes have been reported by Fehrmann.<sup>7</sup> He attempted to establish a differential diagnosis that would enable one to distinguish the two entities, but the clinical differences were slight and the pathologic picture of both was that of vascular and circulatory changes. In the comparative clinical and pathologic studies of the diabetic and nondiabetic rubeotic eyes he pointed out essential differences sufficient for him to place them as entities. He found the nondiabetic rubeotic iris vessels to be larger and to run in a layer

of connective tissue attached to the anterior limiting layer and at times to surpass the pupillary margin. The latter has never been observed in rubeosis. The iris stroma in nondiabetic patients contains connective tissue which so far has not been observed pathologically in rubeosis. Nondiabetic glaucomatous scar tissue in the iris angle consists chiefly of dense tissue whereas in rubeosis synechiae the capillaries predominate in the adhesion and extend to the angle. Rubeosis is often accompanied by new-vessel formation in and on the papilla and in the retina underneath the limitans interna.

A study of the reported cases reveals that rubeosis iridis occurs in cases of severe diabetics in the young as well as in those observed in older cases of mild diabetes which have not been well controlled. For some time we have been impressed by the fact that the metabolic disturbances are often much more serious in the juvenile diabetic than in senile cases. We, therefore, must conclude that rubeosis does not depend entirely upon the severity of the diabetes. It is my opinion that rubeosis iridis is caused chiefly by vascular and circulatory changes, but the diabetes must be considered as an etiologic factor. If this were not true, the syndrome would be seen in nondiabetics with circulatory changes.

Other points to consider are the possible relationship between hypertension and rubeosis as mentioned by Kurz,<sup>12</sup> and the fact that hypertension and diabetes together in the same patient manifest a much higher percentage of vascular pathologic change than when either is alone. Hypertension and diabetes were associated in thirteen of the 32 reports of rubeosis. Patients suffering from diabetes complicated by hypertension were not significantly younger (average 59 years) than were those who had not the complication of hypertension (average 57

years). As yet, one does not see any more than a possible relationship between rubeosis iridis diabética and arterial hypertension from the small number of cases so far reported.

The writer has seen three patients who presented the syndrome of rubeosis iridis diabética. In addition, two others were seen whose pathologic picture did not conform to the syndrome but so closely approximated the findings that a differential diagnosis was difficult except for the absence of diabetes. These five patients are herewith presented for comparison of their clinical and pathologic manifestations.

#### CASE REPORTS

CASE 1. R. M., a man, 61 years old, had noted gradual failure of vision in both eyes for eight months. No inflammation nor pain was experienced until three weeks before examination, when the right eye became congested, painful, and the vision markedly decreased. He had been a known diabetic for 12 years before, but no treatment had been instituted until the past four years, when dietary and insulin treatments were started. For the past two years he had used no insulin and had not been careful with his diet so that he was occasionally not sugar free.

The *eye examination* revealed vision, O.D. sufficient to count fingers and O.S. 2/60. The intraocular pressure (Schiotz) O.D. was 90+ and O.S. 20 mm. Hg. The right eye was markedly congested throughout. The cornea was edematous; the fundus examination was therefore impossible. The anterior chamber was of normal depth. On the blue iris surface for a width of about 1 mm. about the pupil and inside the zig-zag line there was a definite reddish flush produced by the presence of clumps of fine new-formed capillaries as seen by the slitlamp. These



Fig. 2



Fig. 3



Fig. 4



Fig. 5

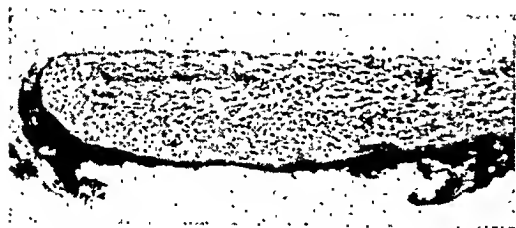


Fig. 6



Fig. 7

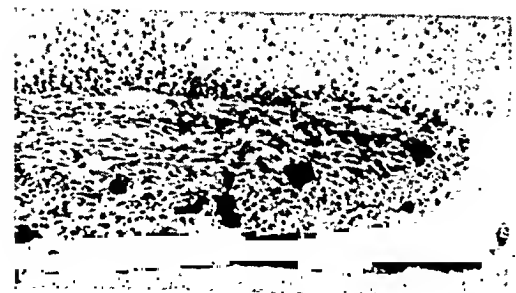


Fig. 8



Fig. 9

tufts of capillaries were not diffusely disposed about the pupil but were patchy in their distribution. Several larger vessels, radiating from these vascular tufts, proceeded toward the iris base. These radiating vessels either disappeared behind the limbus or ended in capillary tufts on the anterior iris surface before reaching the limbal area. The peripheral capillary tufts also disappeared behind the limbus. The pupil was round, measuring 4 mm. in diameter, and was fixed to light and in accommodation. No synechiae were found. The iris stroma aside from the new-formed vessels appeared normal. No keratic precipitates were present. Transillumination was negative for intraocular tumor.

The left eye presented a normal anterior segment. The vitreous was loaded with fine opacities. There was a subhyaloid hemorrhage below the disc. Many lipid infiltrates were noted in and about the macular area. Numerous scattered punctate retinal hemorrhages were present throughout. The retinal arterioles showed marked sclerosis and variation in caliber.

Gonioscopic examination of the right

eye showed the presence of complete anterior synechiae. The peripheral new-formed vessels on the anterior iris surface in some places extended onto the posterior surface of the cornea and in other places it did not reach the corneal surface. The large vessels seemed to disappear in the capillary tufts or iris stroma. The left eye presented normal angle markings and no new-formed vessels on the anterior iris surface peripherally.

General physical examination showed a blood pressure of 180/120; advanced generalized arteriosclerosis; and moderate cardiac enlargement with blowing apical systolic murmur.

Laboratory examinations: Blood Kahn negative. Fasting blood sugar 276 mg. percent. Urine showed 4+ albumen, 4+ sugar, many red blood cells, and waxy and granular casts.

*Diagnoses.* O.D., rubeosis iridis diabetica; secondary glaucoma. O.S., retinitis hemorrhagica; retinal arteriolar sclerosis. Diabetes mellitus. Arteriosclerotic and hypertensive heart disease with cardiac enlargement and nephropathy. Generalized arteriosclerosis.

---

Figs. 2-9 (Fralick).

Fig. 2. Case 1, right eye. Photomicrograph showing peripheral glaucomatous anterior synechia. New-formed blood vessels seen to extend from anterior iris surface to cornea at *a*.

Fig. 3. Case 1, right eye. Photomicrograph showing new-formed "rubeotic" blood vessels on anterior iris surface in scar tissue causing ectropion uveae.

Fig. 4. Case 1, right eye. Photomicrograph showing hyaline coagula associated with hemorrhagic retinopathy in the outer plexiform layers of the retina.

Fig. 5. Case 2, left eye. Photomicrograph showing typical glaucomatous anterior synechia without prominence of blood vessels in the scar. New-formed blood vessels on the anterior iris surface peripherally extend along synechia to cornea. Hydroptic degeneration of posterior pigment epithelium of iris is marked.

Fig. 6. Case 2, left eye. Photomicrograph showing new-formed blood vessels on the anterior iris surface in an inflammatory membrane which causes ectropion uveae.

Fig. 7. Case 2, right eye. Photomicrograph showing glaucomatous anterior synechia without blood vessels in the scar. At *a* is a blood vessel extending from the anterior iris surface to the cornea. Hydroptic degeneration of the posterior iris pigment epithelium is marked.

Fig. 8. Case 2, right eye. Photomicrograph showing thickening of anterior stromal tissue of iris causing ectropion uveae. New-formed blood vessels on anterior iris surface in sphincter region are conspicuous.

Fig. 9. Case 2, right eye. Photomicrograph showing organized inflammatory and hemorrhagic exudate on optic disc and retina. Exudate extends between retina and choroid.

*Course.* Miotics were employed and did not decrease the tension nor ocular pain. The right eye was enucleated.

*Pathologic examination.* O.D., Army Medical Museum accession number 73483. *Gross:* Firm eye measuring 25 by 24 by 24 mm. The cornea is clear. The eye is opened in the horizontal plane. The vessels radiating from the optic disc are prominent. The region surrounding the disc is thickened and dotted with opaque and hemorrhagic areas. The lens is opaque. *Microscopic:* Descemet's membrane is irregularly thickened at the periphery. The iris shows peripheral anterior synechiae of the typical glaucomatous type. There is no noticeable increase in the blood vessels in this scar as compared to the usual glaucomatous scar. There are some new-formed blood vessels on the peripheral anterior iris surface, which, along with scar tissue, extend forward for a short distance on the posterior surface of the cornea. There is a variable amount of iris atrophy. At some points of the pupillary margin a variable amount of ectropion uveae exists. There is a definite thickening of the stromal tissue on the anterior iris surface, indicating an inflammatory reaction in this case. There is seen a variable amount of new-formed vascularization, particularly over the sphincter muscle. Some hemorrhage is noted in the iris in the region of the anterior synechiae. There is slight hydroptic degeneration of the iris pigment epithelium. Pigment on the anterior lens capsule and a comparable loss of pigment from the posterior iris surface indicate the former site of a posterior synechia. The ciliary processes are hyalinized. There are some hyalinization of the walls of the retinal vessels and hemorrhages in the nerve fiber and outer plexiform layers. Numerous hyaline coagula are present in the outer plexiform layer, particularly in the macular region, and in this layer are

also seen lipoidal histiocytes. There is a small area of microcystic degeneration on the nasal side posteriorly. A little hemorrhage appears in the vitreous chamber. The optic disc and lamina cribrosa are slightly depressed. No new-formed vessels are seen on the surface of the retina and optic disc.

CASE 2. B. G., a woman, aged 34 years, had noted visual failure in both eyes 10 months previously, and had not been able to read after two months. One week before examination the left lids became so edematous that she could not open the eye. There was pain and inflammation of the eyeball associated with the edema. She had learned that she had diabetes and hypertension during pregnancy, 14 years before and had been treated for these since then, but had found them both difficult to control. She had noticed dyspnea on walking up one flight of stairs. She also had had convulsions during the aforementioned pregnancy.

The eye examination showed an uncorrected vision of O.D. 1/60, and O.S. "moving objects." The intraocular pressure (Schiotz) was O.D. 29 mm. and O.S. 90+ mm. Hg. The external examination of the right eye was normal except for the absence of the direct light pupillary reflex. The fundus showed scattered punctate retinal hemorrhages, scattered lipid retinal infiltrates centrally, and marked retinal arteriolar sclerosis.

The left eye showed edema of the cornea but no keratitic precipitates. There were no posterior synechiae. The pupil was dilated to 4 mm. and fixed, irregular in outline. Just outside the pigmented margin of the pupil the iris showed a fine network of new-formed vessels which covered the sphincter zone and gave a reddish hue to this portion of the iris. From this vascular zone on the surface of the iris several more or less straight

vessels coursed toward the base of the iris, some disappeared behind the limbus, and others were found to terminate in small capillary networks. The remainder of the iris did not appear to show signs of inflammation. The fundus examination was impossible for details because of the edematous cornea. Transillumination was negative for intraocular tumor.

*Gonioscopic examination.* The patient was too ill to permit study.

*General physical examination* revealed a blood pressure of 200/100; adenoma of the right lobe of the thyroid; and heart of borderline size with systolic murmur at the apex.

*Laboratory examinations.* Urine showed 4+ albumen, 2+ sugar, and amorphous casts. Blood—hemoglobin 70 percent, red blood cells 4.01, white blood cells 11,750; differential and smear normal. Blood Kahn negative. Fasting blood sugar 140 mg. percent. Blood non-protein nitrogen 53.5 mg. percent.

*Diagnoses.* O.S., glaucoma (acute, congestive); rubeosis iridis diabetica. O.D., retinitis hemorrhagica; glaucoma (secondary). Diabetes mellitus. Chronic glomerular nephritis. Secondary anemia. Nontoxic thyroid adenoma. Secondary hypertension.

*Course.* Intensive miotic therapy together with 15 mg. retrobulbar mechoyl chloride reduced the tension in the left eye to 47 mm. Hg (Schiotz), but after 24 hours the tension was again stony. The patient was extremely ill and the relatives refused the advice of enucleation of the left eye and removed the patient from the hospital. Tension in the right eye was reduced to 22 mm. (Schiotz), but it was felt that this eye also was headed for trouble. The left eye was later removed by Dr. Ray Hughes of Detroit, Michigan, and sent to the Army Medical Museum.

The right eye remained painless and

the tension normal until two months later, when the patient returned to Dr. Hughes with a tension of 10 mm. Hg (Schiotz). The pupil was dilated and immobile. Vision was 20/300. The anterior chamber was deep. The patient had no pain. There was a well-developed rubeosis iridis. The cornea was clear. Fundus examination at this time showed retinal hemorrhages and a preapillary growth of new-formed blood vessels which extended forward into the vitreous for 5 to 6 diopters. Mecholyl and prostigmin contracted the pupil to pinhead size and the tension was reduced to 50 to 55 mm. Hg (Schiotz). Under the influence of the vaso-constrictive mecholyl, the rubeotic vessels disappeared and the iris assumed its normal appearance. Corneal abrasion and ulceration together with violent uveitis developed as the result of tonometry, and the right eye was enucleated by Dr. Hughes. This eye was also sent to the Army Museum.

*Pathologic examination.* Army Medical Museum accession number 75587. O.S.: *Gross:* Firm eye measuring 25 by 24 by 25 mm. The cornea appears clouded. The eye is opened in the horizontal plane. The region surrounding the macula is opaque. The vessels radiating from the disc are distinctly defined. The lens is opaque. There are a few posterior synechiae at the pupillary margin. *Microscopic:* A little hemorrhage is present in the anterior chamber. There are peripheral anterior synechiae of the characteristic glaucoma type except that there are new-formed blood vessels on the anterior surface of the iris peripherally and it is possible to trace these for a short distance into the juncture between the cornea and the iris in the adhesion. The anterior surface of the iris is covered by a definite vascular membrane. The blood vessels are most numerous in the sphincter and peripheral regions of the iris. There are advanced

cystoid or hydroptic degeneration of the pigment epithelium of the iris and a low degree of ectropion uveae. Pigment on the anterior lens capsule indicates that posterior synechiae were present. Calcified drusen appear at the ora serrata. The choroid is not remarkable but the ciliary body shows considerable atrophy. The ciliary processes show hyalinization. The retina shows hemorrhages in the nerve fiber and outer plexiform layers, edema and loss of normal architecture at the macula, engorged and sclerotic vessels, and hyaline coagula around the macula. There is an area of retinal separation about the disc. On the nasal side the pigment epithelium does not extend to the disc margin, and on the temporal side all the layers of the retina extend out over the nerve. The optic disc is cupped and the lamina cribrosa is depressed.

*O.D.: Gross:* Soft eye measuring 23 by 23 by 22 mm. There is a small corneal ulcer slightly off center and thickening at the limbus. The eye is opened between the horizontal and vertical planes. An opaque exudate fills the anterior chamber. The lens is opaque and the vitreous is cloudy. There is a threadlike adhesion from the raised disc to the vitreous. The optic nerve is too short for cross section. *Microscopic:* The epithelial layer and Bowman's membrane are absent (some sections) over a purulent corneal ulcer. Purulent exudate fills the anterior chamber and infiltrates the iris. Hemorrhage is present in the anterior chamber and around the pupillary margin of the iris. There are peripheral anterior synechiae of the typical glaucoma type. Very few blood vessels are seen at the juncture of the iris and cornea, but there are a few on the peripheral portions of the iris central to the anterior synechiae. There is a vascular membrane on the anterior surface of the iris, vascularization of the

pupillary portion over the spinster region being the most prominent. There are ectropion uveae and marked hydroptic degeneration of the iris pigment epithelium. Pigment on the anterior lens capsule indicates that posterior synechiae were present. There are edema and hyalinization of the ciliary processes. The ciliary body and choroid are atrophic. There is a little chronic inflammatory cell infiltration in the uveal tract. The retina shows reduction of ganglion cells and atrophy, and gliosis of the nerve fiber layer. There are small serous exudates in, and microcystic degeneration of the outer plexiform layer, and rarefaction of the inner nuclear layer in the macular region. Organizing inflammatory and hemorrhagic exudate extends from the optic disc into the vitreous chamber and has proliferated both on the inner surface of the retina and between the retina and underlying choroid. An apparent vascular occlusion in the optic disc is believed to be an artifact. The lamina cribrosa is depressed and the optic nerve is atrophic. There is chronic inflammatory cell infiltration of the episclera.

CASE 3. E. H. F., a woman, 59 years old, had known for three years that she had glaucoma. The increased tension was controlled with eserine until November 8, 1941, when she had an attack of acute glaucoma in the right eye. The tension of this eye had never been controlled since. The eye had given pain more or less since this attack. The patient was under the care of her local physician for hypertension but had never known of the presence of diabetes.

The eye examination revealed a vision of O.D. light perception; and O.S. moving shadows. The intraocular pressure was O.D. 90 mm. (Schiotz) and O.S. 20 mm. Hg. Slitlamp examination



showed the right cornea to be edematous, but there was no evidence of anterior uveal disease. The iris of the right eye showed new-formed, fine blood vessels on its anterior surface. These vessels were outside the pigment border and largely confined to the sphincter area. There were a few larger radiating vessels from this marginal plexus which went to the base of the iris and disappeared behind the limbus. The pupil was slightly dilated and fixed. No fundus details were seen through the edematous cornea. Transillumination was negative for intraocular tumor.

The left eye was negative externally but the fundus examination showed scattered punctate retinal hemorrhages, moderate retinal arteriolar sclerosis, and in and about the central area were scattered lipid exudates.

*Gonioscopic examination.* The right eye showed complete anterior synechiae so that none of the angle markings were visible. There were clumps of new-formed vessels on the anterior iris surface peripherally which were not seen on external examination. These extended up onto the posterior surface of the cornea. The left eye showed normal angle markings with no clumps of new-formed vessels visible. There were no synechiae.

*General examination.* Generalized arteriosclerosis. Heart slightly enlarged. Blood pressure 185/110.

*Laboratory examinations.* Fasting blood sugar 170 mg. percent. Urine showed 4+ sugar and 1+ albumen.

*Diagnoses.* O.D., glaucoma (chronic uncompensated), rubeosis iridis diabetica. O.S., retinitis hemorrhagica, arteriosclerosis (retinal). Diabetes mellitus. Hypertension.

*Course.* Intensive miotics and retrobulbar mecholyl did not reduce the tension of the right eye below 75 mm. Hg

(Schiotz). The pupil was constricted and the ruby-red coloration of the iris lost due to the marked vasoconstriction of the new-formed vessels on the anterior iris surface. The right eye was enucleated by Dr. E. W. Campbell of Toledo, Ohio, and sent to the Army Medical Museum.

*Pathologic examination.* O.D., Army Medical Museum accession number 78450. *Gross:* Moderately firm eye coated with hemorrhage, measuring 24 by 24 by 25 mm. The cornea is opaque, the limbus is thickened. The eye is opened, presumably in the horizontal plane. The vitreous is cloudy and the lens is opaque. Numerous areas of retinal hemorrhage are noted. The sclera is thin. The optic nerve is too short for independent section. *Microscopic:* Hemorrhagic exudate extends over the cornea on one side. The corneal epithelium is thin. There is a little hemorrhagic exudate in the anterior chamber. There are peripheral anterior and marginal posterior synechiae and ectropion uvae. The anterior synechia does not entirely cover the trabecular fibers. There is no noticeable vascularity of the juncture between the iris and trabecular fibers. A vascular membrane is present on the anterior surface of the iris. The new-formed blood vessels are especially noticeable over the sphincter and peripheral portions of the iris. The iris pigment epithelium shows hydroptic degeneration of a slight degree. The ciliary processes are hyalinized. The choroid is somewhat thin, and there are occasional early excrescences on Bruch's membrane. The retina shows cystic degeneration at the ora serrata, reduction of ganglion cells, and atrophy of the nerve-fiber layer. The inner nuclear layer is thin. There is edema of the outer plexiform layer in the macular region. Retinal vascular changes are slight. There is a little serous exudate beneath the retina on the nasal



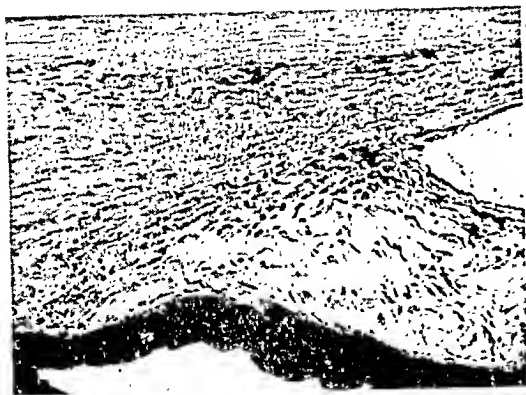


Fig. 10



Fig. 11



Fig. 12



Fig. 13

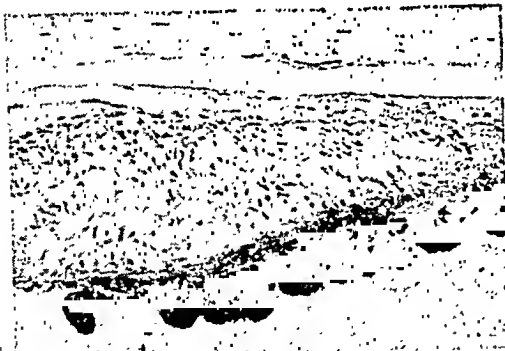


Fig. 14



Fig. 15

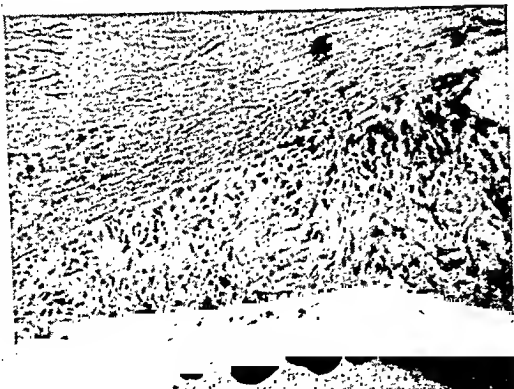


Fig. 16

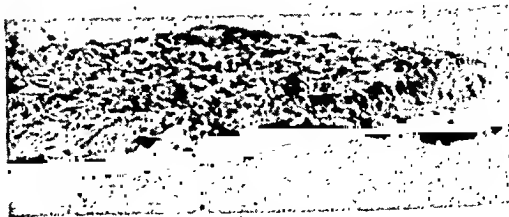


Fig. 17

side. Occasional small hemorrhages are seen in the outer plexiform layer. A vascular membrane covers the optic disc and adjacent retina. The lamina cribrosa is depressed.

For comparison, there is presented the same clinical picture in eyes from two nondiabetic patients in the two following cases.

CASE 4. A. R., a women aged 61 years, had noted progressive visual loss in the left eye for five years. The eye was blind in two years. There was no inflammation nor pain until three weeks previous to examination, when the eye became very painful and inflamed. There were no symptoms referable to the right eye. General health was asymptomatic.

The *eye examination* revealed a vision of O.D. 6/6, and O.S. nil. The intraocular pressure (Schiotz) was 22 mm. in the right eye and 90 mm. Hg in the left eye. The external and fundus examinations of the right eye were normal. The left eye showed generalized injection of the globe. The cornea was edematous to such an extent that the fundus could not be seen. Transillumination was negative for evidence of intraocular tumor.

The slitlamp showed no evidence of anterior uveal disease. The pupil was slightly dilated and fixed. About the pupillary margin there was a ring of new-formed blood vessels on the surface of the iris, giving this sphincter portion of the iris a reddish hue. These new-formed vessels were very fine and individually could be seen only with magnification. Extending from this nearly diffuse ring of vessels to the base of the iris were several larger vessels on the iris surface. These latter vessels to some extent anastomosed with one another. The radiating vessels ended either behind the limbus or in small clumps of fine new-formed vessels on the peripheral iris surface.

*Gonioscopic examination.* The right eye showed normal angle markings and no new-formed vessels. The left eye showed complete obliteration of the filtration angle from anterior synechiae. New-formed blood vessels, both fine and coarse, were seen on the synechiae up to the point of adhesion with the corneal surface.

*General examination.* Blood pressure 180/110; physical findings otherwise normal.

*Laboratory examination.* Blood Kahn

Figs. 10-17 (Fralick).

Fig. 10. Case 3, right eye. Photomicrograph showing glaucomatous anterior-root synechia not entirely covering the corneo scleral trabeculum. Blood vessels not conspicuous in the scar.

Fig. 11. Case 3, right eye. Photomicrograph showing vascular membrane on anterior iris surface most marked in the sphincter region. Ectropion uveae is marked.

Fig. 12. Case 3, right eye. Photomicrograph showing vascular membrane on the surface of the optic disc and retina.

Fig. 13. Case 4, left eye. Photomicrograph showing malignant melanoma, Callender-spindle cell, subtype B, arising in the choroid.

Fig. 14. Case 4, left eye. Photomicrograph showing glaucomatous peripheral-root synechia without blood vessels' being a feature of the scar.

Fig. 15. Case 4, left eye. Photomicrograph showing vascularized inflammatory membrane on the anterior iris surface causing ectropion uveae. New-formed blood vessels prominent in sphincter and basal portions of anterior iris surface.

Fig. 16. Case 5, right eye. Photomicrograph showing peripheral glaucomatous anterior-root synechia without evidence of blood vessels as a prominent feature of the scar.

Fig. 17. Case 5, right eye. Photomicrograph showing new-formed blood vessels on the anterior iris surface at the sphincter region. There was no evidence of membrane formation on the iris surface in this case.

negative; urine showed no albumen nor sugar. Glucose tolerance test:

	mg. %	Urine
Fasting	76	negative
First hour	108	negative
Second hour	117	negative
Third hour	95	negative
Fourth hour	79	negative

*Diagnoses.* O.S., glaucoma (absolute); arterial hypertension. Rubeosis iridis.

*Course.* Intensive miotic therapy and 15 mg. retrobulbar mecholyl had no appreciable effect on lowering the intraocular pressure. The left eye was enucleated and sent to the Army Medical Museum.

*Pathologic examination.* O.S., Army Medical Museum accession number 75310. *Gross:* Firm eye coated with hemorrhage measuring 25 by 23 by 25 mm. The cornea is clouded and thickened. The eye is opened in the horizontal plane. The retina is detached, and behind it are firm translucent gelatinous exudates and a mushroom-shaped, deeply pigmented growth. The tumor mass measures 9 by 12 by 12 mm., and extends from a point midway between the optic disc and the equator to a point a few millimeters above the equator. The iris adheres to the anterior surface of the lens. *Microscopic:* Arising in the choroid just posterior to the equator is an irregularly pigmented mushroom-shaped tumor that has broken through Bruch's membrane and invaded the retina. Extrabulbar extension is not seen. Thin-walled blood spaces are abundant in the deeply pigmented portion of the tumor. The tumor cells are spindle shaped with oval nucleolated nuclei. A Wilder reticulum stain shows an argyrophil fiber content of more than 50 percent. Tumor type—Malignant melanoma, Callender-spindle cell, subtype B, choroid. Serous exudate occupies the anterior chamber. The iris is atrophic and shows anterior and posterior synechiae and ec-

tropion uveae. A few thin-walled blood vessels are seen in the membrane on the anterior surface of the iris especially in the sphincter region. (I believe that the vessels on the anterior iris surface which gave the ruby coloration to the iris about the pupil would have been more easily seen microscopically if adrenalin had not been instilled accidentally at the time of operation. Adrenalin compounds cause the rubeosis to disappear grossly.) The ciliary processes are hyalinized. There is lymphocytic infiltration of the choroid, particularly anterior to the tumor, and there is vascular engorgement posterior to it. Numerous colloid excrescences are present on Bruch's membrane. The retina is detached with serous exudate and pigment-laden phagocytes beneath it. It is adherent over the tumor, contains serous exudates, and is cystically degenerated and gliosed. Atrophic and degenerative changes are present throughout. The nerve head is invaginated, the optic disc is cupped, and the lamina cribrosa is depressed. There is perivascular lymphocytic infiltration of episcleral and orbital vessels.

CASE 5. W. F., a man aged 53 years, while feeding a printing press six weeks previously noted sudden loss of vision in the right eye. There was no inflammation nor pain until four weeks later, when the right eye became inflamed and painful. General health had always been good aside from a coronary occlusion two years before and a goitre operation seven years previously.

The *eye examination* revealed a vision O.D. of light perception, and O.S. 6/12. The intraocular pressure (Schiotz) was O.D. 90 mm., and O.S. 23 mm. Hg. The right eye showed generalized injection. The slitlamp examination revealed keratic precipitates on the posterior surface of the cornea. The cornea was edematous

to a slight degree. The pupil was dilated and fixed. Just outside the pupillary pigment border of the iris was a somewhat dense new formation of fine capillaries surrounding the pupil, giving the iris in the sphincter region a reddish hue. From this plexus of blood vessels extended straight or diagonally radiating vessels to smaller peripheral plexuses, some of which seemed to take part in the anterior-root synechiae. The basal anterior synechiae were very broad since they were seen through the cornea especially down and nasally. The optic disc showed cupping and atrophy. The retinal veins were full but only slightly tortuous. The retina appeared atrophic and presented innumerable hemorrhages throughout. The arteries showed moderate arteriosclerosis. The external and fundus examinations of the left eye were essentially negative.

*Gonioscopic examination.* The right eye presented complete anterior-root synechiae. There were foci of fine new-formed blood vessels on the anterior synechiae, the vessels in places reached the cornea and disappeared into the iris tissue. The left eye presented a normal filtration angle with no new formations of iris vessels.

*General examination.* Blood pressure 115/75; general physical examination normal.

*Laboratory examination.* Blood Kahn negative. Fasting blood sugar 91 mg. percent. Urine showed no sugar nor albumen.

*Diagnoses.* O.D., glaucoma (secondary). Occlusion central retinal vein. Retinitis hemorrhagica. Retinal atrophy. Rubeosis iridis.

*Course.* Intensive miotic therapy and retrobulbar injection of 15 mg. of mecholyl did not reduce the tension in the right eye. Adrenalin was instilled in the right eye, causing blanching of the rubeotic vessels of the iris, and the entire globe became white. The right eye was

enucleated and sent to the Army Medical Museum.

*Pathologic examination.* O.D., Army Medical Museum accession number 83612. *Gross:* The specimen consists of a firm eye measuring 23 by 25 by 24 mm. The cornea is clear; the pupil is dilated. The eye is opened in the horizontal plane. The disc is slightly cupped and the lens is opaque. *Microscopic:* There are peripheral anterior and marginal posterior synechiae. There are no conspicuous increases in the blood vessels at the junction of the iris and the posterior corneal surfaces. There is atrophy of the iris and vascularization of the pupillary zone. Only an occasional vessel is seen on the iris surface at the site of the anterior synechiae. No inflammatory membrane is noted on the anterior iris surface. The ciliary body is atrophic and the processes are somewhat hyalinized. There are multiple small colloid excrescences on Bruch's membrane. Multiple small retinal hemorrhages involve the nerve fiber, outer plexiform, and intervening layers. The retina has undergone atrophic changes, and in the macular region loss of ganglion cells, rods and cones, and of normal architecture is apparent. A little plastic exudate extends forward from the depressed optic disc into the vitreous chamber. Occlusion of the central vein is not seen in longitudinal nor in cross section. Vascular changes are not striking.

#### Σ SUMMARY AND CONCLUSIONS

Four eyes in diabetics and two eyes in nondiabetics, all showing rubeosis iridis, were examined clinically and pathologically in an attempt to confirm or deny Fehrmann's contention that a differential diagnosis is possible between the two groups. Contrary to his findings in comparing the diabetic with the nondiabetic eyes, the writer could note no definite difference upon slitlamp examination in the

TABLE 1  
DATA ON 32 CASES OF RUBECOSIS IRIDIS DIABETICA

Author	Year of Report	Cases	Rubecitic Eye O.D. O.S.	Age	Sex	General Medical Status	Glaucoma	Response to Medicine or Surgery	Assoc. Fundus Findings	Remarks
Salis, R.	1928	1	x x	56	M	Diabetes Hypertension	O.U.	Miotics, No Cyclodialysis, No	Hem. retinopathy, High myopia	
		2	x x	64	M	Diabetes	O.U.	Miotics, No	Hem. retinopathy	
		3	x x	75	M	Diabetes	O.U.	Miotics, No	Arteriosclerosis	
Axenfeld, Th.	1929	1	? ?	?	?	Diabetes	Yes	?	Hem. retinopathy	
Arruga, H.	1932	1	? ?	?	?	Diabetes	Yes	?	?	Absol. glaucoma
		2	? ?	?	?	Diabetes	Yes.	?	?	Absol. glaucoma
		3	? ?	?	?	Diabetes	?	Iridectomy, No	?	Diabetic iritis expulsive hem. after surgery
		4	? ?	?	?	Diabetes	?	?	?	Diabetic iritis
Gil, R. R.	1933	1	x x	?	?	Diabetes Hypertension	O.U.	?	Hem. retinopathy	
Waldstein, E.	1934	1	? ?	47	F	Diabetes Hypertension	Yes	?	Not visible	Absol. glaucoma in rubecitic eye
		2	? ?	68	F	Syphilis Diabetes Hypertension	Yes	?	?	Absol. glaucoma in rubecitic eye. Hem., Retinopathy other eye
Villani, G. <sup>15</sup>	1934	1	? ?	?	?	Diabetes	Yes	?	?	Diabetic iritis
v. Sallmann, L.	1935	1	? ?	64	M	Diabetes Hypertension Renal insuff.	No	?	Hem. retinopathy, arteriosclerosis	Hyaline protuberance at pupil border
		1	x x	62	M	Diabetes	O.U.	Miotics, No Trephining, No	Hem. retinopathy, O.D.	Absol. glaucoma, O.S.
Motélese, A.	1935	2	x x	51	M	Diabetes	O.U.	?	Vit. hemorrhage, O.D.	Absol. glaucoma, O.S.
		3	x x	60	?	Diabetes	O.S.	?	Hem. retinopathy, O.D.	Absol. glaucoma, O.S.
		1	x x	64	M	Diabetes	O.U.	Trephining O.S., No	Hem. retinopathy	Absol. glaucoma, O.D. Quiet iritis, O.S., later glaucomatous
Gallino, J. H.	1936	1	x x	49	M	Arteriosclerosis Diabetes Peri. neuritis	O.U.	Miotics, No Trephining, No	Hem. retinopathy	
Lawrence, R. D., and Levy, A. H.	1936	1	x x	29	M	Diabetes Hypertension Aeromegaly Diabetes Hypertension Renal insuff.	O.U.	Miotics, No Iridend., O.D., No Trephining, O.S. No. Miotics, No	Not visible, O.D. Hem. retinopathy, O.S.	Gonioscopic exam.
Kurz, O.	1937	2	x x	66	F		O.D.		Not visible, O.D. Hem. retinopathy, O.S.	Gonioscopic exam. Absol. glaucoma, O.D. Path. report, O.D.

TABLE 1—Continued

Author	Year of Report	Cases	Rubeotic Eye O.D. O.S.	Age	Sex	General Medical Status	Glaucoma	Response to Medicine or Surgery	Assoc. Fundus Findings	Remarks
Grandi, G. <sup>18</sup>	1938	1	x	69	M	Diabetes Hypertension	O.S.	Miotics, No	Hem. retinopathy	O.D. normal eye
Favaloro, G.	1938	1	? ?	?	?	Diabetes Hypertension	Yes	?	?	Absolute glaucoma One eye Path. report
		2	? ?	?	?	Diabetes Hypertension	Yes	?	?	Absolute glaucoma one eye Path. report
Fehrman, H.	1939	1	x	69	F	Diabetes Hypertension	O.D.	Miotics, No	Not visible, O.D.	Absol. glaucoma, O.D.
		2	x	61	F	Diabetes Hypertension	O.U.	Paraesthesia, No	Hem. retinopathy, O.S.	Absol. glaucoma, O.S.
		3	x	59	F	Diabetes Hypertension	O.U.	Miotics, No Trepthing, No Sclerotomy with vit. coag., No	Hem. retinopathy, O.D. Hem. retinopathy, O.D. Not visible, O.S.	Path. report, O.U.
Wegner <sup>17</sup>	1939	1	x	?	?	Diabetes	O.U.	Miotics, No Surgery, ?	?	Intracap. cataract extr., O.U., successful
		2	x	?	?	Diabetes	No		Hem. retinopathy, O.U.	Post. synechia Severe iritis Iris atrophy Absol. glaucoma, O.S.
Alaya Hacedo, A. <sup>19</sup>	1941	1	x	77	F	Diabetes	O.U.	Miotics, No	Hem. retinopathy	O.D. enucleated, Army Med. Museum #6413 Gonioscopic exam.
Sugar, H. S.	1942	1	x	69	M	Diabetes	O.U.	Miotics, No Trepthing, No	Hem. retinopathy Arteriosclerosis	
		2	x	?	?	Diabetes	O.U.	?	?	
		3	x	49	F	Diabetes	O.D.	?	Hem. retinopathy, O.S. Not visible, O.D.	
Fralick, F. B.	1943	1	x	61	M	Diabetes Hypertension Renal insuff.	O.U.	Miotics, No	Hem. retinopathy, O.S. Not visible, O.D.	O.D. enucleated, Army Med. Museum #73483
		2	x	34	F	Diabetes Hypertension Chr. gl. nephritis	O.U.	Miotics, No	Hem. retinopathy, O.D. Not visible, O.S.	Ulcerative keratitis and uveitis from tonome- try, O.D.
		3	x	59	F	Diabetes Hypertension	O.U.	Miotics, No	Hem. retinopathy, O.S. Not visible, O.D.	O.U. enucleated, Army Med. Museum #75587 O.D. enucleated, Army Med. Museum #78450

size or the disposition of the new-formed vessels on the anterior iris surface. Response to miotic therapy was absent in both groups. Both groups complained of intolerable pain to the degree that enucleation was required. A varying degree of iris atrophy was seen in the eyes examined, and yet the rubeotic vessels were still visible in all cases. This could be explained on the basis that the degree of iris atrophy was not sufficient in the diabetic individuals to cause the disappearance of these new-formed vessels. The glaucomatous scar in the filtration angle was essentially the same. The presence of a vascular adhesion between the iris and trabeculum or cornea was not a feature in the eyes of the diabetics studied. Dense tissue predominated in both groups. Unlike Fehrmann's findings, those of the writer showed the new-formed vessels to run in a layer of connective tissue attached to the anterior limiting layer in all eyes except in case 5, where no diabetes was found. There were new-vessel formations in and on the papilla and retina of two rubeotic eyes (cases 2 and 3) in diabetics and no such changes in the non-diabetics. This, however, is not a consistent finding in diabetics with rubeosis,

since two of the eyes herewith reported in diabetics did not show it.

Rubeosis iridis has thus been observed in patients showing rather varied pathologic conditions. One was a young severe diabetic with hypertension and extensive kidney damage; two cases were in more elderly diabetics, both having hypertension. It was seen in two nondiabetics, one having a hypertension and an intraocular malignant melanoma, and the other showing only what was diagnosed clinically as an old occlusion of the central retinal vein. In all of the cases presented herewith, the only common feature was the obvious circulatory disturbance to the degree that rubeosis iridis and hemorrhagic glaucoma developed. The writer, therefore, cannot support the contention that rubeosis iridis is a manifestation of an ocular syndrome seen in its true form only in diabetics. It is his belief that, given the right pathologic vascular supply to the eyeball, metabolic abnormalities will be established to promote a low-grade iritis with new-vessel formation and secondary peripheral-root synechiae, resulting eventually in hemorrhagic glaucoma.

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## OPHTHALMOSCOPY AND THE DIAGNOSIS OF HUMAN ILLNESS\*

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Edward Jackson (1856-1942), one of the greatest of American ophthalmologists, lived in Denver but belonged to the United States, for he travelled over the entire country, spreading the gospel of medical preparedness. Early in his career, he graced the Chair of Ophthalmology in the Philadelphia Polyclinic and School for Graduates in Medicine, and later as professor of ophthalmology brought renown and fame to the University of Colorado.

He had an unusual talent as an organizer, for, not only did he institute the Ophthalmic Section of the College of Physicians of Philadelphia, play a leading part in the founding of the American Board for Ophthalmic Examinations, which was the first and the model for all American certification boards, but in addition to these monumental achievements, he with Dr. Bane and Dr. Black started the Denver Ophthalmological Society, and later the Colorado Ophthalmological Society with its world-renowned summer course of intensive lectures and demonstrations. Unique in concept, this has

served as the stimulus to the founders of the many courses subsequently established elsewhere.

His qualities of leadership were demonstrated when he was chairman of the Section of Ophthalmology of the American Medical Association, president of the Academy of Ophthalmology and Otolaryngology, and president of the American Ophthalmological Society. In further testimony of his professional attainments, he was awarded the Lucien Howe Medal of the American Ophthalmological Society and the Leslie Dana Medal for conspicuous achievement in the field of preventable blindness.

Dr. Jackson was a prolific writer. More than 650 papers and addresses, as well as several textbooks, are evidence of his industry and the wide range of a brilliant mind. He made several original discoveries, and his work on skiascopy will always remain a classic.

When editor of the *American Journal of Ophthalmology*, the *Ophthalmic Year Book*, and *Ophthalmic Literature*, he reached a world audience.

Edward Jackson was a remarkable teacher. Endowed with a retentive memory and an alert, inquisitive mind, he recorded his observations based on reading and personal experiences in a most

\* Colorado Ophthalmological Society Jackson Memorial Lecture. The lecture was illustrated with 100 slides; but because of the difficulty of reproducing photographs during the war, the illustrations are omitted.



impressive and convincing manner. Few ophthalmologists have ever ranked with Jackson the discussor.

The study of the life of Dr. Jackson, and his good works, will influence all who practice the healing art. I am, therefore, deeply sensible of the honor conferred upon me to inaugurate the Colorado Ophthalmological Society Edward Jackson Memorial Lectures, a memorial to a great scientist, a world-renowned ophthalmologist, an inspiring teacher, an erudite editor, a sympathetic humanitarian, and a wise counselor beloved by all who knew him.

Because of the many facts disclosed by ophthalmoscopy, this presentation is limited to a few selected groups. It is well known that there is a similarity between the fundus vessels and those of other parts of the body, and for that reason the inspection of the fundus supplies information not secured by any other method of examination.

Sudden closure of an artery leads to immediate partial or complete loss of function, which is either transitory or permanent, depending upon the nature of the local blood supply and the part of the body involved.

In the abrupt closure of the central retinal artery, the portion of the retina supplied by this vessel becomes pale, and, after turning white, the color gradually returns leaving two permanent signs—white, narrow, threadlike arteries and a white atrophic optic disc. When closure is caused by an embolus, there is no free retinal blood. The visual loss is irremediable and unaltered by medical or surgical intervention. I am convinced that when recovery is reported, the poor sight was the result of a spasm of the arteries and not the plugging of a vessel. To the internist, the patient with an embolus presents a problem, especially if there is no valvular heart disease or other evident

source of the obstruction. Most often the primary cause is not discovered, although endocarditic vegetations, fragments from a venous thrombus, or from an infected uterus, lung, or other organ may be the origin.

Immediate cessation of arterial blood shows as an interrupted blood stream with spaces between the cells and a slow propulsive pulsation of short excursion. Because the choroid shows through the thinnest part of the retina, the macular region remains colored, yellow, orange, or red. This so-called "cherry-red spot" is at first small, gradually enlarges, and often terminates in fine granules. The size of this area is, therefore, of considerable medico-legal value, for if the patient says he has just lost his vision and a large cherry spot is present, he is in error.

Frequently, patients are subjected to long and costly examinations to discover the cause of blindness in one eye, occasionally both, and not infrequently only a partial loss of one. Careful scrutiny of the retinal arteries will often confirm the diagnosis of sudden artery closure, and the impossibility of restoring vision. If the blindness is of spastic origin, the alterations in the caliber of the arteries are often visible but not always. The actual embolus has been seen and in branch block photographed.

Considerable time and energy have been spent on the interpretation of the sudden artery closure. Some competent clinicians believe the occlusion is the terminal stage of endarteritis, and we can readily agree when streak hemorrhages are found in the superficial retina. This differentiation seems to be borne out in clinical cases but has not been confirmed pathologically. When the physician thinks of these changes as occurring in the brain, for instance, he can understand the symptoms more clearly and forecast the end result with greater accuracy. Parentheti-

cally, it must be understood that the retinal vessels do not always reflect the state of the cerebral circulation.

In contrast to artery closure is vein occlusion, wherein the blood is retained within the eye, and the veins become distended with much or little bleeding in, on, or above the retina. The typical picture is well known; the disc outline is lost, the immense veins lie in the edematous blood-filled retina, and the central vein or branch is plugged.

The clinical course of closure is best studied in branch-vein block where, in the beginning, thin blood follows the retinal fibers in their arcuate distribution. The hemorrhage becomes denser, then whitish areas appear, gradually both blood and the white spots are absorbed as new vessels form the compensatory circulation. The closed vessels may become white lines or scarcely visible.

Total central-retinal-vein thrombus may terminate in one of three ways, complete resolution, organization of scar tissue, or glaucoma. The first two are similar to the general body terminations, and even the increased ocular tension, hemorrhagic glaucoma, may have its counterpart in the great, expanding swellings of cerebral-vessel thrombosis. The danger of a secondary destructive glaucoma is ever present. When the intraocular pressure is once elevated in thrombosis of the central retinal vein, it rarely, if ever, subsides, and usually causes an intolerable constant pain, which can be relieved only by enucleation. Organization is more common than complete resolution. Branch block rarely causes glaucoma, but it must be remembered that glaucoma may cause hemorrhage, and the differentiations between hemorrhagic glaucoma and thrombosis is an ophthalmologic problem. The vein closure may be from an embolus or the result of an endophlebitis.

Much has been written regarding

arterio- and arteriolarsclerosis. The ophthalmoscopic signs are not so clear cut as the discussions and the drawings suggest. It is essential to remember that arteriosclerosis and hypertension are not the same, for arteriosclerosis may be present with normal or even theoretically subnormal blood pressure. Incidentally, I heartily approve of any measures which the internists may promulgate to teach the public the truth about blood pressure, its interpretation, and real significance, for such knowledge will decrease the so-called hypertensive neuroses on one hand and on the other make those in real need of medical supervision seek a physician and follow his common-sense instructions.

In speaking about arteriosclerosis, it must be understood that vein compression, where the stiff artery presses the underlying vein or elevates the overlying one, is of significance only when the other signs of arteriosclerosis are present. Physiologically normal arteries may dent normal veins. Textbooks continue to stress the importance of twisting of the arteries as they cross the veins. This, I believe—and this opinion is based on photographic evidence—is much overrated and calls for a critical review. When the sclerosis is partial, white plaques may be found in the vessel wall; when more extensive, the wall may be white; and when extreme, the wall is widened to a broad, white band. The appearance depends upon the cause of the arteriosclerosis, as, for example, syphilitic vessels may be much more defined than those resulting from age and those from hyperpiesia may lie between the two and be either partial, disseminated, or general. Each case must be studied as an individual and the special alterations observed. Generalized arteriosclerosis gives a distinctive pattern of white arterial tree with a pale, or white, optic disc.

The sclerosis of choroidal vessels is a

favorable type for study, for the individual vessels in every layer can be isolated. Cases of sclerosis of both arteries and veins are found.

The close associations of prolonged hypertension and arteriosclerosis are recognized. There are, however, many degrees of hyperpiesia not separable into stages. They are too uncertain for that, nevertheless are demonstrable as progressive from mild to severe. A study of the patients operated upon for the relief of hypertension is enlightening. The reports of the fundus changes fail to show any correlation between the retinal pattern and the need for operation. At the present time, I do not advise sympathetic-system operations, for I am unconvinced of their value.

Clinicians must devote more time to the early diagnosis of hypertension. No region offers a better field for investigation than the fundus, where the earliest change may be an isolated, whitish-gray cloud in the superficial retina, the so-called cotton-wool exudate. This is always suggestive, and in this day of universal blood-pressure determination there is no excuse for overlooking its significance. Next in frequency are retinal hemorrhages of the superficial, striate type. Edema of the retina is an early and important change, and the constant need of appraising its increase or decrease is ever present, for when it is extreme all fundus details are indistinct, when localized to the nerve-head there may be a nasal side elevation or a complete papilledema so great as to suggest a serious, expanding brain lesion.

One should never forget that when a patient known to have had a comparatively negative fundus shows fresh changes, localized edema, or hemorrhages, these new signs should be interpreted as evidence of a beginning breakdown. When dark-brown or red granular hemorrhages develop in the deep retina, the

danger to life is acute and calls for the immediate consultation with the family. It has long been recognized that as time passes the retinal edema subsides; this must not be incorrectly interpreted as an evidence of improvement. The course of hypertension is one of interrupted or continuous progress. Many patients, especially women, have been seen for more than 20 years before any hemorrhage appeared and in many the systolic pressure was always 200 or higher.

More attention must be given to the signs of beginning decompensation. A single retinal hemorrhage may be the signal of approaching death and, if disregarded, danger lies ahead. The extensive exudates and the papilledema are more often recognized because of their grossness.

The ophthalmologist refers hypertensives to the internist with the knowledge that only by the coöperation of the patient can the best results be obtained. At times the situation is hopeless from the beginning, either because the disease is too far advanced or the patient so pessimistic that he will make no attempt to survive. The war is exacting an ever higher and higher toll of hypertensives because of the worries and anxieties coincident with the disruptions of life, and the excessive physical and mental exertion. Incidentally, a not-unusual early sign of hypertension is unilateral exophthalmos.

When considering the fundus changes resulting from nephritis due consideration must be paid to both arteriosclerosis and hypertension, for often it is difficult to separate the signs of one from those of the other. This is particularly true in cases of malignant hypertension with terminal kidney changes. When a patient whose fundus had shown no gross evidence of disease returns complaining of decreased sight, the fresh changes may be

so striking as to warrant a serious prognosis. Often such patients make no complaints about their eyes and yet retinal hemorrhages and exudates may be so numerous that one wonders why they have not appreciated their visual defects. The severe retinitis and neuroretinitis is familiar to ophthalmologists because it has been taught in all medical schools. At times a high N.P.N. is the only clinical evidence of the cause of delicate macular radiations. These disappear when correctly treated. The favorable cases are in marked contrast to those of massive exudates and hemorrhages, where the damage is not only irreparable but also irreversible and progressive. When first examined the retina may be edematous. As the edema subsides a macular star is formed; this is gradually absorbed but frequently the patient dies of uremia or cardio-vascular disease before it completely disappears. The understanding of the life cycle of the star is essential to accurate prognosis.

No fundus reflects the skin color more strikingly than does the red fundus in the fat, florid patient, nor the pale fundus in the nephritic with anemia. The importance of basing the prognosis on the underlying cause rather than on the disappearance of edema and exudate was photographically recorded in a young woman with nephritis. All the fundus landmarks were at first obscured by the extreme retinal edema, exudates, and waxy star. Immediately before death the edema disappeared and only a few isolated exudates suggested the former star.

The retinitis of pregnancy, although suggestively similar to other nephritic forms, is, however, often preceded by signs which are easily overlooked. The alert obstetrician knows that the first ophthalmic sign of danger is a spasm of one or more retinal arteries with transitory obscuration of vision. When the spasms

increase in frequency or duration, or both, a competent ophthalmologist must be consulted, for, if the patient is allowed to continue her pregnancy to term, a severe retinitis may develop, leaving a permanent pigmentary scarring or an optic atrophy; or a progressive hypertension may be initiated with papilledema and visual reduction, causing a severe curtailment in all physical efforts. The fundus picture of an acute pregnancy retinitis is the same as that found in any acute nephritis.

A fundus pattern somewhat like nephritis appears in traumatic retinal angiopathy, and is due to head injury, or chest or spine compression. The actual cause of the changes is unknown. Fat emboli have been suggested but not proved to be the activating agent. While speaking of the rare it is appropriate to say a word about angiomas of the retinae, Lindau's disease, because of the general as well as local manifestations. The characteristic fundus shows immense, tortuous veins and arteries with one or more angiomas into which the twisting artery can be traced and from which the vein can be followed. This is a familial disease, with brain cysts resulting from the small angioma. The picture, distinctive and once seen never forgotten, is of much interest to internists, neurologists, neurosurgeons and ophthalmologists.

Retinal angiomas may be very small and numerous, or large and single. Occasionally, a congenital anomaly shows dark aneurysmal angiomas like great bunches of purple grapes.

There are few conditions which cause more differences of opinion than does diabetes with retinal changes. The ophthalmologist sees extensive alterations and refers the patient to the internist with a note stating the diagnosis as retinitis in diabetes.

The internist reports that the sugar

level is normal and the diabetes is under control. The retinal signs change but rarely completely disappear. Perhaps the situation is hopeless but the number of patients, the functional loss, and the subsequent great mental upset call for a concentrated effort to solve the problem of their cure. To assist in the solution of the difficulty it is necessary to have a clear concept of what the retinal changes look like. The earliest signs are isolated, minute, round hemorrhages, or pinpoint exudates, or a combination of the two. In the cases of longer duration larger hemorrhages and larger exudates are present. The hemorrhages are frequently of the streak type, and the yellowish white exudates are widely dispersed in the posterior pole or in and about the macula. Frequently, these are thick masses, at other times isolated plaques similar to the lace crown of the so-called retinitis circinata. It must be thoroughly understood that there is no pathognomonic fundus pattern of diabetes, for all of the changes can be duplicated in arteriosclerosis, and even lipaemia retinalis may result from high cholesterol.

Sometimes, as for instance in resolving thrombosis, the small, hard, yellow exudates and scattered hemorrhages without marked retinal-vessel alterations are suggestive of diabetes and call for the exclusion of hyperglycemia as the first step in establishing the etiology. The retinitis in diabetes has a persistency which distresses all who care for it. Occasionally, large fundus hemorrhages become entirely absorbed, but more often they become organized as sheets of retinitis proliferans. The usual case of diabetes shows a rather constant change in the size and location of the exudates and hemorrhages. A critical analysis of 200 diabetic retinitis cases studied photographically, and several of them serially for a considerable time, seemed to prove that the

hemorrhages are not the forerunner of the exudates and, further, that in all probability the hard, yellowish-white exudates are not secondary to hemorrhages and, further, that the deep retinal hemorrhages do not become white specks.

The retinal exudates and hemorrhages seem to bear no relation to the efficacy of the diabetic treatment, for we have seen them in the so-called mild diabetes easily controlled by diet and others regulated with insulin. The retinitis may be present before any treatment is started, and in other cases, even when everything from the internist's standpoint is going nicely, fresh hemorrhages and exudates appear as the older ones lessen or disappear. The venous circulation is now under the spotlight of special study. The fundus changes in diabetics show a marked tendency to variation when no particular care or attention is given as well as when the patient is under the most approved scientific controls. Insulin does not increase the retinitis.

The imperative need of greater coöperation between internists and all interested in the eradication of diabetes is the result of several intercorrelated factors which can only be mentioned in this short clinical résumé. First, the introduction of insulin. The life expectancy of the juvenile diabetic has been considerably prolonged, and he is carried into adult life. Second, the relegation of arteriosclerosis as the cause of the fundus picture to a comparatively unimportant position. Third, the more competent and regular fundus examination of diabetics. Fourth, the seeming and doubtless very real increase in the retinal disease. Fifth, the almost complete lack of control once the retinal lesions have become fixed. This depressing fact is constantly borne in upon us, although occasionally the retina becomes clear and the exudates disappear.

Sixth, the longer the patient has diabetes the more he is predisposed to the refinitis. Therefore, juveniles are most liable to severe, invaliding visual disturbances. This emphasizes the well-known fact that many patients under seemingly perfect sugar control develop a progressive retinitis.

Finally, no treatment seems to retard or remove the evidence of retinitis. Some very competent observers believe without clinical support or experimental evidence that insulin induces it. Perhaps experiments with alloxan will supply the missing information and suggest the cure.

Tuberculosis is so familiar to you who live in this region of unusual good health that little need be said regarding it. Hemorrhage from a retinal artery may become absorbed and leave no trace. Tubercles may enlarge, new ones form and coalesce. In some patients hemorrhages are prominent and may disappear or form scars, or an expanding lesion or lesions, or a retinitis-proliferans sheet or veil. A solitary tubercle is most commonly in the macular area.

During the acute stage the vitreous is cloudy with a peculiar luminosity which makes penetration difficult, and photographs disappointing. Clinically, this seems to be very distinctive; in fact, a sign of clinical value. The tubercles of the acute miliary form are observed practically only in the terminal stages of the general disease. Choroidal tuberculosis has a tendency to recur as soft, gray, ill-defined masses which contract and finally heal. There are as many grades and types of tubercles in the eye as elsewhere in the body. It is especially interesting to follow cases similar to those so well described by Jackson and Finoff, where the tubercles lie in apposition to the vessels.

An evening could be devoted to the fundus changes caused by syphilis. It is conceded that there are two major sub-

divisions of involvement, the vascular and the neurologic, and that rarely do the two mix. This theory seems to hold in ophthalmology, where, if a patient has a choroiditis, he never develops a primary optic atrophy.

The vascular changes are small choroidal spots, often with a faintly pigmented border, well dispersed about the posterior pole. The graphic writers of other days spoke of this as a pepper and salt fundus. The grosser choroidal inflammations leave large or small, many or few pigmented scars, not absolutely diagnostic but suggestive of syphilis. Between these two are groups of medium-sized, round, heavily pigmented areas in the equatorial or peripheral regions.

Neurologic signs are optic neuritis with marked loss of vision and an elevated disc, and primary optic atrophy with sharply demarcated disc and progressive loss of visual field, ending in bilateral atrophy and blindness. Sometimes a child is infected, as, for instance, by a wet nurse. The optic atrophy is progressive. And, finally, a gumma may form in the optic nerve causing a pronounced swelling of the disc which eventually subsides, leaving a large, white scar.

The systematic blood states like leukemia, pernicious anemia, and polycythemia vera present, at times, extensive and suggestive hemorrhages and exudates which may be the first evidence of the approaching termination. Incidentally, it is time that the medical profession keeps blood-state tragedies out of the daily press, and that when a disease like acute lymphatic leukemia is under treatment the futility of transfusions be appreciated, so that valuable blood plasma may be saved for the Armed Forces instead of being wasted.

Because of the widespread interest and unwarranted optimism regarding night-blindness, attention is called to four

types. The classical, well-recognized, fairly common one is retinitis pigmentosa, an hereditary disease characterized early in life by impaired night vision. The loss is progressive until the patient becomes blind in the late decades of life. In this disease the fundus shows an equatorial zone of branching, pigmented cells, and a narrowing of the arteries and the veins leading to an optic atrophy. Nothing has ever checked the disease.

Closely allied to it is a childhood night-blindness without pigment, but white dots cover the fundus—retinitis punctata albescens. In advanced life, there is a superimposed pigmentation similar to that found in retinitis pigmentosa. There is also a form, nyctalopia, without pigment or white spots.

A number of patients with myopia are night-blind, and a careful inspection shows that the choroid is thin, suggesting the fourth group, choroideremia, which is a progressive dissolution of the choroid, eventually leaving only small islands of functioning choroid in the macular region and about the disc. Some syphilitics develop night-blindness and have a chorioiditis which may be ameliorated but not cured.

The time has arrived when the medical profession should arise to contest the unfounded claims of the publicity seekers who arouse unfounded hopes of cure and lead the disappointed in their rush to the charlatans.

No talk on fundus lesions would be complete without reference to papilledema, often called choked disc. It is advisable to disregard most of the textbooks and think of papilledema in the strict sense, an edema of the nervehead. In its earliest stages there is an increase in the translucency of the nerve fibers, obviously for anatomic reasons, first observed where the fibers are most numerous, in the nasal portion of the disc. As the

edema increases, more and more of the fibers swell, and as a result they surround the central excavation. This cup is retained even when secondary exudate and hemorrhages obscure the disc margin. Often it is recognized only by careful stereoscopic examination and photographs, and for that reason has not been given its proper position in the diagnosis of papilledema.

Time, the duration of the pressure, plays an important role in the individual variations for, other things being equal, the longer the process the greater the disc changes. An inspection of the nervehead in prolonged intracranial pressure will readily confirm this statement. Other elements enter into the production of choked disc, and in this brief account mere mention of them must suffice. In the course of some acute mastoiditis cases the edema of the disc may be of considerable degree and lead the uninitiated into a panic of reoperation. Usually, the condition is transitory and quickly subsides. The disc is of the smooth, rounded type, with few or no hemorrhages in contrast to the papilledema of the sinus thrombosis, where hemorrhages are, both early and prominent. Similar in gross appearance is the papilledema from orbital abscess, orbital cellulitis, ethmoiditis, sphenoiditis, or sinus thrombosis. The swelling is often unequal, there being more on the side of the greater compression, if and when both sides are involved.

The wet brain of syphilis causes disc swelling of variable degrees, and the papilledema of hyperpiesia may be so extreme as to call for the most discriminating analysis of all the physical signs and symptoms, including X-rays and air injections before the final diagnosis of high blood pressure is made. This is at times a very difficult task, for brain tumor may be present in a patient with hypertension, and unless operated upon the termination



is fatal. The usual hypertensive choked disc is a smooth, rounded swelling, varying in color from yellow to water-soaked gray. This is in contrast to the choke of thrombosis of the central vein, where immense veins and extensive retinal hemorrhages are dominant.

Brain tumors are the major cause of choked disc, and the physician of today is ever alert and always studies the ocular fundus in any patient with headache. Too much stress cannot be laid on this essential procedure to prevent some patient from being operated upon for nonexistent sinusitis while some others, labeled neuropsychopathic, will receive the benefit of modern neuro-surgery. Several years ago, Parker reported on the difference in degree of disc swelling and said that it was greater in the eye with the lower intraocular pressure. This may have some bearing on the cases of frontal-lobe tumor, where one disc is swollen and the other atrophic, the Foster Kennedy syndrome. An arachnoiditis causes papilledema, and, when of traumatic origin, a crown of blood surrounds the elevated disc. The hemorrhage may even flood the retina. The error of confusing optic neuritis with papilledema persists, and yet few observers will frankly state that the classical signs and symptoms need revision. The disc may be greatly swollen in what proves to be a neuritis, and the reverse, little swelling, found in a papilledema. All reference to the diagnostic importance of the degree of disc swelling should be based on the practical understanding of the process. Textbooks say that up to 2 diopters it is optic neuritis; when greater, papilledema. A fairly safe clinical rule is to think of neuritis when reduced vision is the dominant symptom and the visual fields and

the disc changes confirm the impression. In choked disc the average patient complains of general symptoms such as headache, nausea, and vertigo rather than loss of vision, and only the ophthalmoscopic examination discloses the swollen disc. Much can be done and will be in the near future to lessen the confusion that leads to delay in diagnosis and postponement of corrective treatment. Enough has been said to elicit interest in segregating the pressures from the inflammations, which include disseminated sclerosis and acute myelitis.

In closing, a word to those especially concerned with treatment of patients in advanced life. Geriatrics is not a specialty. All who practice medicine appreciate that there is a wide discrepancy between chronologic age and tissue maturity. The subject is fascinating, but we can refer to only one of the age tragedies, senile macular degeneration. The patient complains of difficulty in reading, may drift about and buy several pairs of glasses before the macular lesion is discovered. This is at first a small central, retinal or choroidal hemorrhage, then an edema of the retina followed by cellular infiltration and an expanding ring of superficial and deep blood. It may be years before the scars causing the central scotoma and impaired central vision become stationary. The patient is unable to read, becomes very apprehensive, and unless told that he will never go blind as a result of the disease, may become despondent. Therefore, my closing message is to understand and explain senile macular degeneration as well as the other innumerable fundus changes, a few of which have been presented for your review.

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## A DISCUSSION OF OCULAR MALINGERING IN THE ARMED SERVICES

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A discussion on malingering in the Armed Services is not satisfactory until a definition for the term is agreed upon. The one given by Balser<sup>1</sup> is adequate: "Malingering is a conscious design or effort on the part of a serviceman to escape service in the Armed Forces by assuming a physical or somatic illness or by magnifying consciously any organic illness which in itself is not a basis for a discharge from military service." The first recorded definition, as published in Groves Dictionary in 1785 is "A military term for one who under pretense of sickness evades his duty." For the purpose of this discussion, the term will be confined to military life and not include civilian deceptions such as the claiming of illness or injury for the purpose of obtaining a compensation in civil life. The writer believes that the term should be reserved to indicate feigning of the serious sort, principally reserved for feigning to attempt to avoid all military duty, to avoid combatant or other hazardous service, or to obtain a discharge from the military service; and he agrees with Waud<sup>2</sup> that the terms "gold-bricking" or "soldiering" and other less severe terms should be used for minor, conscious feints to avoid duty or work which are very common in military life; the intention to avoid these duties in itself is not punishable. The half-hearted attempt of inductees in the preliminary examinations when not persisted in, should hardly be called malingering, as when a draftee, upon being asked to read as far down on the chart as he can see, says that he has poor vision in one eye and reads only to 20/100, but if urged will soon read the 20/20 line. Malingering, then, as a term should be reserved for the persistent,

conscious, willful design and effort on the part of the man to tell and demonstrate his simulated physical or mental defect rather than weakly to mention that he has this condition. The malingerer is fixed in carrying out his purpose to a result.

Malingering must be clearly differentiated from other simulative manifestations. As Brussel and Hitch<sup>3</sup> point out, it is conscious and excludes the phenomena of the psychoneurotic, particularly of the hysterical and anxiety neurotics whose symptomatology is the unconscious ego requirement finding externalization. Carpenter<sup>4</sup> states that it is difficult for many medical officers to accept the fact that malingering and psychoneuroses are distinct clinical entities; the treatment for one is useless for the other. Psychoneurosis is an actual illness. The malingerer<sup>5</sup> lies, the other tells what he believes to be the truth, although it may be true that neither wants to return to duty. Though Grinker and Spiegel<sup>6</sup> say that the greatest problem associated with malingering is the ready conclusion by many medical officers that mild neurotic symptoms and true conversion phenomena can be simulated. It is true that some psychoneurotics exaggerate their symptoms more or less unconsciously to gain their ends, which makes it difficult to differentiate where neurosis ends and malingering starts. The crucial differential point between malingering and a psychoneurosis is that malingering is conscious and a psychoneurosis is unconscious. Some malingerers, as Rosenberg<sup>7</sup> asserts, have a constitutional psychopathic personality, but, on the other hand, some are cool and calculating and seem to have no evidence of psychopathic

personality other than a lack of conscience. Many are below average intelligence.

In my experience of 18 months at the Connecticut induction center, the incidence of ocular malingering was fairly high before Pearl Harbor, averaging about 7 percent in selectees examined, but it dropped off very markedly when war was declared, probably to 2 or 3 percent. In a large basic training center where 500 to 1,400 newly arrived trainees were medically processed a day we found the incidence of ocular malingering to be less than 0.5 percent. Agatston<sup>7</sup> says that in routine army-induction examinations it was between 0.5 and 3 percent. Waud<sup>2</sup> asserts that it is most common among selectees during the first year of service, new recruits, and among those who have been assigned to the guardhouse, or among those who have undergone disciplinary action. Grinker and Spiegel<sup>5</sup> saw only one or two cases in Tunisia. Brussel and Hitch,<sup>3</sup> at the Fort Dix Station Hospital, found that of all cases referred for neuropsychiatric consultations 7 percent were diagnosed as malingerers. Statistics of malingering, like all other things medical, may vary greatly when taken by two men examining the same group. One physician may include only the true, persistent, conscious simulator, another the half-hearted attempt to deceive, and even the exaggeration of illnesses and defects that most psychoneurotics are prone to exhibit. Again the experience of another observer may be only with picked combat troops.

The cause of malingering is inherent in all of us. Gainer<sup>8</sup> says that "evidence of malingering is exhibited very early in life, making it seem almost an innate characteristic of man." Bowers<sup>9</sup> points out that many soldiers have been inducted into the service against their will or to

their financial, educational, or social detriment. These men consciously or unconsciously grasp at any possible physical ailment that may improve their present situation. This was particularly true of the selectees inducted before the war, when the reason for compulsory military service had not yet crystallized and any method of avoiding service was condoned by families, friends, and even in some instances by public officials. Once war had been declared, malingering to avoid military service became an unpatriotic and cowardly offense and one not committed by good citizens. There are only three aims in true military malingering, as Agatston<sup>7</sup> points out; namely, to avoid all military service, to obtain limited or perhaps noncombatant status; or to obtain a discharge from the Army with or without compensation. However, by men in exhausted states, after long, unpleasant, and dangerous military duty, it is sometimes used to obtain temporary rest, recreation, and good food. In this instance it is questionable whether the malingering is part of a psychoneurosis or not. I do not agree with Brussel and Hitch,<sup>3</sup> who say that malingering is unquestionably a form of inborn constitutional psychopathic inferiority, although Grinker and Spiegel<sup>5</sup> think that the basis of malingering is usually a highly neurotic background. Usually, as Miller<sup>10</sup> says, the difference between a malingerer and the man who goes sick with feigned or exaggerated symptoms for small things, is that the latter is satisfied to be given a chance to escape from a false position without undue loss of self-respect. This latter class is the group which passes on into hysteria frequently, if not recognized and reprimanded. In viewing malingering, the cause and the time of occurrence should be fully considered. For instance, combat troops or flying personnel may refuse to go back

into action, others may feign illness or injury to avoid returning, and still others may have a true conversion hysteria, depending upon the moral and mental stability of the individual. The first instance is the brazen but honest individual, the second is the underhanded and dishonest man, but neither has neurotic symptoms and usually little feeling of self-condemnation, because of his own rationalization. As Grinker and Spiegel<sup>5</sup> point out, these soldiers have simply not adapted their ideals to the current military environment and have little conscience about their conduct. They behave as if they have done their share and the rest is the responsibility of someone else. This is often the expressed attitude of many previously brave and successful fliers. I saw a flying officer who had returned from many missions over Germany, and who on being given the examination for flying claimed just poor enough vision in both eyes to avoid further flying combat duty. On being detected, he simply stated that he felt that he had enough combat duty and was lucky to return alive. He felt that someone else should take his place. The more brazen type is illustrated by the case of a bombardier who, when he was sent to the hospital for a simple operative correction of an extraocular muscle imbalance, refused to have the operation performed because if his muscle balance was corrected, he would return to flying duty. This he did not wish, because he said that he had sufficient combat and chose to remain within the continental limits of the United States. He signed a statement to that effect. Apparently, refusal to return to duty or "partial" malingering is more commonly found in this war than conversion hysteria such as was found in World War I, which Strecker<sup>11</sup> believes may have been due to

the relatively few ground troops engaged. It is probably also due to the mobility of the present warfare.

Detection of malingering, in general, depends upon the alertness and experience of the examiner. After working for some time, particularly in induction examinations, one feels that he can sense the malingerer as soon as he comes into the room. Most malingerers enter the examination room with an unusual attitude; it may be bellicose, aggressive, or it may be with a great deal of timidity. The gait and manner in which the patient handles himself usually arouse suspicion. Simulation<sup>12</sup> is always in keeping with the extent of the knowledge possessed by the individual regarding the particular disease from which he pretends to suffer. It is always impossible for the healthy person to feign the entire picture of the disease he has selected, thus the examiner can usually detect omissions, discrepancies, and contradictions. Cozen<sup>13</sup> and Grinker and Spiegel<sup>5</sup> suggest the use of morphine or hypnotic drugs to uncover simulation and to secure confession.

In detecting ocular malingering, each case should be treated as an individual problem, because the means of detection that are successful with one man may not work with another. In the preliminary or early military examinations it has been the writer's experience that many men who premeditate malingering are discouraged from it by a somewhat bellicose and aggressive manner on the part of the examiner; and if malingering is attempted, intimidation by threats, ridicule, or sarcasm is often discouraging, at least to the naïve and unpracticed simulator. If the malingering is persisted in, the examinee is best stood to one side; and I believe that the man should stand up while awaiting a more opportune time for lengthier examination. Standing in

one spot for some time under apprehension as to the results of the delayed examination is very exhausting and discouraging to many men. This crude approach does not work and should not be used on the more hardened, intelligent, and experienced malingerer. For men of the latter type who are usually encountered later in military service and who wish to avoid being sent to combat duty, the concealed sympathetic approach is more successful, for it puts the malingerer off his guard and secures better cooperation. A complete history should first be taken, including that of his family, for often psychic disturbances in a parent give a clue to the background of the man's actions. The time of occurrence and believed reason of onset of the claimed disability should be determined. Most psychoneurotics date the disability from some very definite emotional event, whereas the malingerer frequently is vague about the time of onset and its etiology. The protracted examination and prying questions irk the malingerer, but the hysteric eagerly answers all questions. The actual examinations should be made rapidly, and a careful record kept. During the actual examination it is well to have witnesses present with a view to the possibility of later courtmartial. Once sufficient evidence of malingering is secured, ridicule, sarcasm, and an attitude of disbelief may be adopted. This may be injected insidiously but clearly, to let the falsifier know that his simulation has been detected. He may be sent away to return for another examination, when he will sometimes admit his deceit. The element of surprise is sometimes useful; for example, suddenly telling the man he is a liar and asking him the reason. This often unnerves the malingerer, and a confession may be obtained. If possible it is well to have a signed confession; few

malingers, however, will sign an incriminating paper except by intimidation, which would not look well in court-martial.

In cases of doubt, reports of previous examinations by oculists or optometrists with record of the patient's vision can usually be obtained, for if the patient has deficient vision even in one eye he usually is cognizant of the fact, has sought medical aid at some time, and is frequently wearing glasses. However, too much reliance should not be placed on ocular examinations just prior to induction in the Army, because in some instances the inductee has gone to an oculist and malingered on the examination in the doctor's office to establish evidence of poor vision. There have even been cases in which the physician falsified his report of vision. Many states require a visual examination before an automobile driver's license is issued, and usually their record of vision can be readily obtained from the Motor Vehicle Department. If insurance has been taken out, the insurance company or its local representative may have a record of vision. Many of the larger industrial concerns give preemployment examinations and will have a record of the man's vision. Knowledge of the previous occupation of the examinee will often throw light on the approximate vision necessary to perform a certain task. Information regarding the patient's vision may also be obtained through the Red Cross, the patient's neighbors, or relatives.

There are six forms of malingering,<sup>2</sup> and these may be divided into positive, in which the man attempts to prove his falsification, or negative, in which he falsely denies history or physical signs of existent disease or injury:

(a) By simulation, the symptoms of an injury or disease which does not exist

are feigned.

(b) By falsification, the signs of the disease are misrepresented.

(c) By false attribution, the cause of the disease is falsified or there is the assignment of an untrue cause to an actually existent disease or injury.

(d) By exaggeration, the signs and/or symptoms of an existent disease or injury are intentionally increased.

(e) The disease or injury is intentionally inflicted by the man himself or by his request and with his knowledge.

(f) Dissimulation is the pretense that a real disease or injury is not present or is less serious than it really is. Or the man may deny the existence of prior injury or disease before coming into the service in order to obtain compensation or discharge. All forms of malingering fall into the aforementioned categories or a combination of them.

#### SPECIFIC TESTS FOR DETECTION

A. VISUAL. It is important, in making most of the visual tests, that the patient should not close either eye during the examination, and a very careful and constant watch must be maintained by the examiner to see that this order is carried out. The more practical tests only are herein described.

1. *Claim of partial loss of vision in both eyes.* This is the most difficult falsification to prove and is the one most frequently used. It is also the most frequent simulation of the conversion hysteric.

a. The retinoscope and ophthalmoscopic examination will readily establish the approximate refraction of both eyes and the probable visual acuity without glasses. For examination of large groups, ophthalmoscopic examination usually provides sufficient information regarding the refraction. The table prepared by Agatston<sup>7</sup> gives approximate

vision for refractive errors without correction.

b. The correction worn in the man's glasses usually gives the approximate refractive error, but occasionally there have been found men who have just obtained glasses with large amounts of correction for the purpose of establishing a record of poor vision without and even with glasses. An emmetropic person, for instance, may wear heavy minus lenses; and, indeed, it is not infrequent to find that the optometric examiner may have prescribed a good deal more minus power than the patient requires.

c. To determine the acuity of vision without glasses, especially in the myopic, a minus lens with a balancing plus lens may delude the patient into believing that he has his correction before his eyes when actually he has the equivalent of plano. This will give the record of vision without glasses.

d. In the army age group there should be little difference between visual acuity for distance and near. The correlation between Jaeger and Snellen type is valuable, or between Snellen type and test objects.

e. The manner of reading the test type may arouse suspicion. If a person can read all the letters on a certain line correctly he can always read a few of the letters on the next smaller line. The malingerer will frequently read without hesitation down the chart to the end of a certain line, then stop and refuse to see any letters on the next line. On the other hand, he may read every letter on the chart with equal hesitancy and effort as if it were just as difficult for him to recognize the 20/200 line as the 20/50. Again, he may deliberately miscall certain letters. The letter "L" hardly looks like any other, an "F" may be called a "P," or "C" an "O," but if "C" is called "T" when other letters on the same line

are read correctly it arouses suspicion.

f. When partial loss of vision of both eyes is claimed, probably the most valuable test is changing the size of the visual angle by testing the individual at varying distances as 20 feet, 30 feet, 10 feet, 5 feet; 10/20, for instance, is the approximate equivalent of 20/40.<sup>15</sup> If careful checks are made with recordings of vision many malingerers will give themselves away because they do not know which line they should see at a given distance. One occasionally sees a man who has been coached for this examination beforehand. A mirror test with special chart in which the letters are reversed is valuable, because frequently the malingerer does not realize that a chart seen in a mirror is the equivalent of twice the distance to the mirror.

g. If much difference in the visual acuity is claimed, the same tests as those for partial loss of vision in one eye only may be used.

h. Negative malingering to enter the armed services or to maintain a certain status must be kept in mind. Squeezing the lids together to make a stenopaic slit improves vision in cases of refractive error. I have encountered two cases in visual testing in which contact lenses were being worn by commercial airline pilots seeking Air Corps commissions. To my embarrassment, it was not until finger tension of the eyes was taken that this subterfuge was discovered.

2. *Partial loss of vision in one eye only.* The history of the length of time there had been poor vision in the one eye, history of injury or eye operations are most important. Merely because one eye deviates or has deviated does not necessarily mean that the eye is amblyopic; many squinters have 20/20 vision in both eyes, particularly the true alternators. Exaggeration of slight amblyopia is common.

a. Gradle's test with three polaroid discs.<sup>15</sup> One polaroid disc is placed in the trial frame before each eye with the polarizing axis horizontal. The individual is then asked to read the smallest line of letters on the test chart with both eyes open. While reading, the third polaroid disc which has been inserted before the good eye, is rotated so that the polarizing axis becomes vertical. This rotation of the third disc prevents any passage of light to that eye, so that if the reading of the test chart is continued during this time it is evident that the poor eye is the one being used. If the patient stops reading when the good eye is blotted out by polarization, one may start again one or two lines higher and repeat the procedure to determine which line the man can actually read with his poor eye.

b. Polaroid discs with a projection apparatus.<sup>14</sup> A polaroid disc is set in each side of the trial frame with the axes at right angles to each other. A third disc is placed in a projection apparatus and is rotated so that the reading of the test letters of either is blocked out at will. This has the advantage that the trial frame on the patient is not touched at all during the examination.

c. The Snellen test with colored letters on glass illuminated from behind.<sup>15</sup> A test card of special red and green letters on glass may be used with a red glass before one eye and a green glass before the other. The red letters will be invisible to the eye which has the green glass and vice versa. This also may be done by having letters of different color on paper. Most projection apparatus which project red and green letters can be used as well, or the ordinary duochrome check.

d. Test with trial lenses. The refractive correction is placed in the trial frame before each eye. A high plus lens is then placed in front of each eye. The plus lenses are gradually reduced in strength

but much more rapidly for the allegedly poor eye, so that in a few changes only the refractive correction is before this eye. With each change of lenses the patient is asked to read. When the plus is reduced to the refractive correction of the poor eye the best visual acuity with correction of this eye is obtained because the vision of the good eye is still blurred.

e. The bar-reading test of Cuignet.<sup>15</sup> An object such as ruler or tongue depressor is held vertically between the patient's eyes. The reading material, such as the Jaeger card, is held at about 35 mm. away, so that the whole of any one line cannot be seen with either eye; part of each line being covered by the ruler. The subject is then asked to read the smallest print that he is able to. If he reads an entire line he must be able to see it with both eyes, otherwise the portion of the line read with the poor eye would be blurred.

f. The Bishop-Harmon diaphragm apparatus.<sup>15</sup> A test card with graduated letters is held by the apparatus, which consists of a holder at reading distance with a diaphragm held between the holder and the patient's eyes, so that in looking through the diaphragm the patient sees the left-hand letters on the test card with the right eye, and the right-hand letters with the left eye, which confuses him. The visual acuity of the poor eye is thus determined. The same thing can be done with the phoropter provided by the Army, or with the stereoscope, by removing the partition.

g. The test of reading Snellen chart at varying distances and reading in the mirror can be used as described.

h. Duane<sup>16</sup> describes the test of asking the patient to read aloud rapidly and suddenly placing a 4-degree prism up or down before the poor eye. If the eye is very amblyopic and there is no fusion, there will be no effect, otherwise the con-

fusion resulting from the diplopia will make reading poor or impossible.

i. The Harlan test. A +12D. spherical lens is placed before the good eye and a +6D. lens before the other eye. The examinee is given a Jaeger card to read which is held close enough so he can read the test card with the good eye. The card is then gradually withdrawn and if he continues to read when the print is out of focus for the good eye he must be using the amblyopic eye. The degree of visual acuity in the amblyopic eye can thus be determined.

j. Lasky<sup>17</sup> describes Jackson's cylinder test. Two cylinders are placed at right angles to one another before the normal eye, giving the equivalent of a sphere; the correcting lens is also placed before each eye. The patient is directed to read rapidly and one of the cylinders is slowly rotated, blurring the vision of the good eye. A +2D. sph. and the same minus cylinder with their axes parallel may be used before the good eye.<sup>18</sup> As the axis of one lens is rotated, the vision of the good eye becomes blurred.

k. The stereoscope with reading-test cards is useful, such as Keystone cards or others in which some of the letters or numbers are seen with one eye and some with the other. The Keystone test has the advantage of having the test letters of varying size, so that the acuity of the amblyopic eye can be determined.

l. Bakker, according to Lasky,<sup>17</sup> describes a modification of the colored-letter test. The Snellen chart is illuminated with red, green, or yellow rays from a lamp; the patient is fitted with his corrective lenses. The examiner puts a green glass over the patient's good eye and turns on the green light. The patient finds that he can read with his good eye only. The red glass is then put over the good eye, the red light put on and the patient again reads it with his good eye.

Another red glass is put in front of the good eye and a sodium lamp is turned on, or the green lamp might be turned on and, since the rays are absorbed by the glass, he then reads unknowingly with his bad eye.

m. If the good eye is occluded first and vision of the poor eye is tested, many patients who are simulating will read so many lines from the top, or so many lines from the bottom. If one cuts away one or two lines of the top of the chart so that the top line is 20/70 and adds other lines at the bottom such as 20/10 lines, the patient will often be induced to read the equivalent number of lines of smaller visual angle than he has accustomed himself to and so will admit better vision to that degree.

3. *Total loss of vision of both eyes.* The history is very important. The onset of the blindness and the manner in which it occurred is asked. Fundus examination may reveal no pathologic change, which immediately excites suspicion.

a. Pupillary reactions are important. Any accommodation-convergence reaction immediately uncovers simulation, but this is difficult to induce in the patient. Reaction to light is possible even though both eyes are blind if the visual fibers are intact to the geniculate body. Usually the pupils are semidilated in blind eyes and do not respond to light.

b. The optokinetic-nystagmus test attributed to Bach<sup>18</sup> causes a horizontal jerky nystagmus when the subject fixates objects that are moving, such as those seen from a moving train. The optokineticoscope is a vertical drum, about 10 inches in diameter, which has alternate black-and-white vertical stripes, each one inch wide. This drum is mounted vertically on a central rod and revolved slowly. The patient is induced to look toward the drum and, if nystagmus results, the patient must have visual fixation in at least

one eye. It is important to revolve the drum slowly and to have the instrument at the usual reading distance from the patient.

c. Watching the patient cross a room and his manner of approaching objects, such as a stool or chair placed in his path, is valuable. If he is simulating blindness he will usually avoid the object or rush at it and fall over it with unusual force.

d. Most people who simulate blindness wear dark glasses probably in order that by so doing it is possible to prevent observation of the movement of the eyes behind the glasses. The true amaurotic patient does not wear them as a rule.

e. The induction of instinctive reactions on the part of the person can be used. For instance, if a menacing action is made quickly and unexpectedly in front of the patient, or a very bright light is flashed in his eyes, the normal tendency is to flinch and blink and thus vision is proved.

f. The Schmidt Rimpler test.<sup>14</sup> The patient is asked to look at his hands. The actually blind individual will rotate his eyes toward his hands, while the malingerer will look elsewhere purposely.

g. Electro-encephalography<sup>19</sup> has been used. The alpha rays are present in electro-encephalography when the eyes are shut, in blindness, or when there is a uniform light or dark field of vision. They stop when there is enough vision to distinguish large objects. These alpha rays come from the occipital cortex.

4. *Total loss of vision of one eye.* All of the tests used for amblyopia of one eye can be used with these additions:

a. Pupillary reactions are useful. If the eye is blind the consensual pupillary reaction should be present in the blind eye but absent in the good eye, and the direct reactions will usually be absent in the blind eye but present in the good eye.

b. The Jackson test<sup>15</sup> can be used. A.



6-degree prism, base down, is placed before the good eye; the muscle light at the other end of the room is turned on. If two lights are seen, binocular vision is proved.

c. A 10-degree prism, base out, is placed before the blind eye. If there is fixation in this eye and fusion, diplopia will be momentarily induced and the eye will rotate inward to correct it and fuse the two images.

d. A 10-degree prism, base down, is placed before the good eye so that its edge lies horizontally across the center of the pupil while the other eye is occluded. This produces monocular diplopia when the man looks at a distant light. If the prism is then moved upward in front of the good eye and the blind eye is simultaneously uncovered, and diplopia is admitted, there is sight in the blind eye.

e. Strong cylinders<sup>17</sup> of the same strength are placed one before each eye but at right angles to one another. The patient is requested to look at a test light which is flashed on at the other end of the room. If a luminous cross is seen, vision is present in both eyes. Maddox rods can also be used for this.

f. Van Sisley, according to Lasky,<sup>17</sup> makes use of the physiologic blind spots. Three white spots are placed on the tangent screen so that the center spot can be fixated with both eyes and the left-hand spot will fall on the blind spot of the left eye and the right-hand spot will fall on the blind spot of the right eye. If a diaphragm, such as a vertical ruler, is placed between the two eyes just in front of the face, the left blind spot cannot be seen with the right eye and vice versa, so that with both eyes open only the center spot is seen. If the diaphragm is then removed, three spots are seen with both eyes open or if one eye is occluded entirely two spots are seen, the center and the left hand spot with the right eye; and the center and right hand spot with the left

eye. The patient can be tricked into giving the wrong answers.

g. The patient may be placed in a dark room and told to close both eyes. The occluder is held in front of one eye or the other, so that the patient cannot tell which eye is covered; and then a narrow beam of light is flashed on the uncovered eye. If light is seen through the lid of the blind eye, vision in that eye is proved.

h. The perimeter may be used in taking a field with both eyes open. If the test object is seen in the area in which the nose occludes or blocks the vision of the good eye, vision is proved in the poor eye, which is the reverse of Cuignet's confrontation test, in which the examiner passes an object across the field of vision of both eyes and the dishonest subject denies having vision in the nasal field of the sound eye.

B. DEFECTS IN VISUAL FIELDS. The most common and best-known defect in the visual field in malingering or hysteria is concentric contraction, usually demonstrated by the spiral field in which the visible area on the test apparatus seems to grow smaller as the examination proceeds, so that finally the field is reduced to 5 or 10 degrees from the center, or even less. A false tubular field may also be simulated; and this can be detected by testing the fields of vision at different distances from the tangent screen, in which case the malingerer usually maintains exactly the same-sized field at different distances—for instance, 10 cm. from the center—even though the visual angle has changed. The color fields may be reversed. Most simulated defects in fields are easily detected by the examiner.

C. NIGHT BLINDNESS is a not infrequent complaint of men assigned to sentry or other unpleasant duty at night. This symptom is frequently complained of in early basic training, at which time many cases of retinitis pigmentosa or

myopia with retinal degeneration and night blindness are discovered. Kreieleis<sup>20</sup> says that by repeated examinations with the Comberg adaptometer, the malingerer cannot remember his adaptation. The Hecht apparatus can be used even better. The American Optical Company instrument is not so well adapted because it depends on length of time, which is rather easily remembered. The value of Harman's test,<sup>21</sup> using varying-sized colored discs, is questionable. McDonald<sup>22</sup> states that the complaint of poor night vision frequently manifested by poor landings at night is one of the earliest manifestations of an anxiety state in fliers.

D. PHOTOPHOBIA is a frequent complaint in the tropics or semitropics. If it does not disappear with the wearing of dark glasses (in the absence of a visible evidence of pathologic change), it can be assumed to be a manifestation of malingering or psychoneurosis. Many psychoneurotics complain of photophobia, and the wearing of tinted lenses in any individual without adequate reason is an indication of the possibility of a psychoneurotic personality.

E. DEFECTIVE COLOR VISION is rarely simulated and could only be used to relieve a person from flying status. This can be readily discovered by using the American Optical or Ishihara plates or one of the colored-light or -yarn tests. Negative malingering is much more common but can always be detected by these same tests if done properly.

F. EXTRAOCULAR MUSCLE IMBALANCE. The most common complaint of the malingerer on this score is diplopia. There can be no binocular diplopia unless there is a muscle imbalance, either a phoria or a tropia, and unless some degree of fusion is present. Except in the case of paralytic strabismus, any complaint of diplopia should be regarded with suspicion. If the diplopia is of long

standing before induction into the Army, it cannot be very annoying. It is important for the examiner to recognize these facts before testing and treating any extraocular-muscle imbalance. We recently saw a case of unilateral congenital fibrosis of the external rectus muscle. The man was not aware of the condition and had no symptoms until it was accidentally discovered in an examination at a nearby station. The examiner evidently thought that since there was a divergent strabismus upon looking in one direction and a convergent strabismus upon looking in another, diplopia must be present, and ordered an occluder for the involved eye. The man was finally sent to the hospital and the actual condition was discovered. The occluder was removed, the condition was explained to the patient, and he was returned to duty. Now he complained of diplopia even though he had no fusion. This man had a psychoneurotic personality originally, but he has since developed a neurotic fixation because of the poor judgment of the medical officer who ordered the occluder.

Nystagmus can occasionally be simulated. Voluntary nystagmus is pendular and may be unilateral or bilateral. The movements are usually rapid and may be in any direction. They are increased on fixation, convergence, and by increasing the palpebral fissure. It disappears by distracting attention or by blurring the vision, such as by placing a +20D. sphere in front of both eyes. I have seen two such cases in the service. It is produced at will and is not associated with any pathologic entity.

G. PROSIS is occasionally simulated, but it is a difficult simulation to carry out consistently. It is usually adopted by persons of low intelligence and is easily recognized by having someone hold the individual's head firmly and asking the patient to follow a test object as it moves

in all directions of gaze. In true ptosis, the eyes usually elevate although the lids do not, but in false ptosis it is impossible to elevate the eyes without elevating the lids at the same time.

H. LAGOPHTHALMOS AND EXOPHTHALMOS, unilateral or bilateral, can occasionally be produced artificially in talented individuals. But these conditions cannot be maintained voluntarily for long and are soon recognized if nonpathologic.

I. ASTHENOPIA is a frequent complaint of psychoneurotic individuals, particularly if they are doing close work. On the other hand, adequate cause in refractive error, muscular imbalance, or incorrect and inadequate lighting may be discovered. If there is no ocular pathologic change and no other adequate cause can be determined, psychoneurosis or malingering should be suspected. In conjunction with asthenopia headache is a frequent symptom and must be investigated thoroughly before it is waived aside as a simulation. Most simulators of headache are soon detected in actions such as prolonged reading, loud talking, roughhousing, or other boisterous activities which are not well tolerated by one having real headache. A placebo drug may also be given.

J. CILIARY SPASM is occasionally met with in anxiety neurosis or hysteria. I recently saw a man who had a bilateral severe ciliary spasm of 10 or more diopters which was intermittent and seemed to be produced at will without any discoverable cause. On psychiatric consultation there was no other evidence of a psychoneurosis. I never was sure whether the condition was voluntary or not. After the condition had been explained to the soldier he was sent back to duty and has not been heard from since.

K. CONJUNCTIVITIS artificially induced by placing foreign bodies, such as glass and sand or other articles, in the

conjunctival sac<sup>23,24</sup> has been frequently described, but apparently rarely seen during this war. Few men are willing to damage their eyes intentionally, because of the high value placed on the organ of sight.

L. VOLUNTARY BLEPHAROSPASM is occasionally seen. It is apt to continue in spite of local anesthetic drops; when a true blepharospasm disappears. Unilateral blepharospasm is not infrequent when diplopia is complained of.

M. INTRAOCULAR DISEASES are almost impossible to simulate. However, exaggeration of the symptoms, such as defective vision, is not uncommon in these cases. The usual tests for defective vision are used. False attribution is occasionally seen when the individual tries to obtain an Army discharge or compensation for nonservice-connected ocular pathology.

Negative malingering is a frequent occurrence, an attempt being made by the examinee to cover up ocular pathology in order to enter the services or to maintain combatant or flying status.

Although the incidence of malingering is not high in this war, it is important that any attempt at it is effectively dealt with in order to discourage it in other examinees. I agree with Farrell and Kaufman<sup>12</sup> that whenever it appears to the examining physician that an individual is endeavoring to escape service by malingering, if otherwise mentally and physically fit, he will be accepted. I also agree with Bowers,<sup>9</sup> who says that the patient's bluff should be called and if he refuses to be a good soldier, punishment should be immediate and of a severity in keeping with the nature of the case. I cannot agree with Brussel and Hitch<sup>8</sup> that the malingerer should be prevented from gaining entrance into the Armed Forces and that should prevention fail he should be detected and eradicated by discharge, and

should be returned to the community whence he originated. This policy if followed through would place a high premium on falsification to the detriment of the honest individual. It is imperative that line officers as well as medical officers be on the lookout for malingerers. If a case is detected and action is taken word soon gets around that malingering does not pay, if the punishment for this crime is sufficiently severe. Even "goldbricking" and other minor feigning of illnesses should be discouraged. But the major form of malingering to avoid military service, to obtain discharge from the service, or to avoid combat should be treated like any other crime, such as stealing. This is not treated as a psychoneurotic disorder, and neither should malingering. Any malingering that succeeds lowers the morale of the whole organization. It would seem that now that we are at war a stricter policy should be adopted, and the individual should be punished with due regard to the gravity of his offense. The medical officer should remember that his job is detection only, that corrective action is the duty of the man's commanding officer. A psychiatric consultation should be obtained on all malingerers, to differentiate between neurosis and malingering,

and if courtmartial is ordered it is well that a psychiatrist be present at the trial. Prophylaxis for malingering is even more important and is accomplished by the same means that Strecker<sup>11</sup> advises as prophylaxis for neuropsychiatric disabilities. There is a significant relationship between malingering, war neurosis, and morale in the troops. High morale depends on several local factors in the soldier's environment: 1. Healthy training conditions. 2. Sufficient and good-quality food. 3. Sufficient exercise. 4. Supervised sports, and other diversions. 5. Medical care that inspires confidence. 6. Good relationship between the men and officers. 7. Rigid discipline and drilling, which inspires a sense of group security. 8. Talks to groups of soldiers on the psychologic aspect of fear and its understanding. 9. Most important is a clear perspective and appreciation of the ideology for which the war is being fought and the value to the individual, his family, the nation, and the world of maintaining this ideology.

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## PATRON SAINTS OF THE EYES: AN OUTLINE\*

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Healing through saints in early and medieval Christian centuries transcended that by physicians, who were secondary and enjoyed only scant encouragement when saintly personages could be invoked to cure. Man, animals, and the heavens were set by custom in fixed categories: Man was above the beasts but below the angels; he was foreordained to worship God, but all else had been created to serve man. Dissenters forfeited their rights and privileges and were punished publicly. The Christian martyrs, many of whom became saints, were among these because their professed beliefs dif-

fered from those of others in the community.

Lacking the solace of scientific reason, refuge was sought in superficial explanations of terrors of Nature. These developed as narratives that increasingly were employed to diminish the unreasoning fear engendered by abnormal activity of the elements. Thus, naturalistic legends ensued while supernatural legends evolved as stories of the saints.

*Miracles.* A great variety have been reported in some detail but Brewer questions whether all of those vouched for by the Fathers during the first three centuries of the Christian era should be accepted since by far the great majority of all recorded miracles occurred during that single period of time. Sight has been reported to have been restored to persons of all ages and to both sexes and to those who were born blind as well as to those who had become sightless. Miraculous cures most often apparently were

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achieved by the laying on of hands, the making of the sign of the cross, by prayers or by other words, by an attitude of gaze, by bathing the eyes in water used by the healing one, or by a combination of two or more of these methods. The recipients of the return of vision are anonymous in the main or are identifiable only briefly. Very rarely supernatural powers were invoked to effect blindness in an offender.

Popular faith in miracles, particularly in times of illness, evolved from the intimacy of suffering attendant on the close relationship of the sick and the saints. However, as Pettigrew observed, in part, "... all miraculous cures are of the same description, the disorders are similar, and the effects described are precisely the same. It is faith which works the miracle. . . ." But Le Bec, staunch in his belief that there must be recognized the existence of "a mysterious force emanating from the Holy Eucharist," stated: "Miracles are not made to order." Miracles, in the Christian legends which are as venerable as Christianity itself, instanced the intervention of God in such fashion that intangibles assumed reality: The impious suffered righteous punishments and the devout were rewarded and their prayers were heard. The early Western Church only secondarily and with reluctance supported this faith in miracles and in saints, but its blessing permitted the glorification of the miraculous in ecclesiastical art and indirectly was largely responsible for the biographic portrayal of the saints as we know them at present.

*Saints.* The term (from the latin, *sanc-ti*, and the Greek, *hagioi*) refers to members of a Christian community but is applied particularly to those who lived in Jerusalem (Dan vii. 18 sqq., et cetera). The deeds and lives of some individuals indicated exceptional possession of piety and spiritual grace, and this character

was attributed in natural course especially to those who had suffered martyrdom. This first was expressed in the letter of the Smyrna congregation. Communities kept registers of those Christians worthy of public veneration, and this was permissible only by order or authority of the bishop. These names were recited at the Eucharist. Hutton states: "From these diptychs (lists) came the kalendars, and from the kalendars in later days the martyrologies." And it is from the latter that the legends developed.

Christian martyrolatry replaced pagan worship of the dead, but modified pagan *parentalia* became birthday feasts and festivals of the martyrs. Thus, paradoxically, veneration of the saints permitted expression in part, at least, of the basic heathenism which the Church had supplanted. Prayers for saints at eucharistic oblations were transformed into intercessory appeals. Every altar had its relics, and chapels of saints received the sick as once did the temples of Aesculapius. Amulets became a part of the dress, and no important undertaking, personal or communal, was initiated without invoking the aid of appropriate saints. Success usually necessitated a formal expression of gratitude, and recovery from illness after saintly intercession caused the presentation of medical votive offerings to churches, chapels, or altars.

*Hagiography.* The "depositio martyrum" in the calendar of the Roman chronicographer (354 A.D.) is the oldest known calendar, or almanac, dealing with the lives of the saints; however, only the barest biographical facts are recorded and, since these did not satiate the faithful, there developed the hagiographic legend as a literary device to cater to numerous local preferences and mores. These legends entertained as they instructed, edifyingly in religion and morals but, prior to the thirteenth century, they had

been collected only in liturgical manuscripts and differed little from those written from the fourth to the sixth centuries. These Christian legends served originally to epitomize asceticism and martyrdom and to create an apochryphal history of the apostles from the stories of their lives in the Gospel; known facts of genuine martyrologic instances embellished incredible tales for the credulous, and central figures were so interpreted as to leave no doubt of the virtues and joys implicit in the practice of Christian principles. Not infrequently, however, the only historically demonstrable facts in a particular legend are the name of the saint, the fact of canonization, and the date of the festival in question.

The foremost hagiographer, Jacobo da Voragine, the Archbishop of Genoa, portrayed the lives of the saints in his "Legenda aurea." His stories were not new but were arranged in order as in the several calendaria. He constantly moralized under the text of august example, and he was a diligent, uncritical recorder of tradition. As an educator he made available to the many the lore which, in his day, was largely the property of the few with access to monastic lectionaries. His stories were comprehensible to all because of their direct, even coarse, pliant style. Reference so often was made to current moods and beliefs that the work appealed widely to a sorely tried but indefatigably optimistic age. It became the most popular work of the Middle Ages and exerted considerable influence on the arts. It had none of the appearance of the work of an individual; its tone was more that of the accumulated folklore of all Christendom. It provided the average Christian with an escape from the narrow geographic boundaries and the restricted social barriers of his daily existence. And equality of mankind gained a partisan whenever it was learned that the

wealthy and the poor knelt as equal supplicants.

*Intercessory specialization.* Appeals to formerly unknown saints for assistance against certain maladies resulted increasingly in specialization. This refinement is an extension of a constant tendency since earliest antiquity to request special protection for particular bodily parts. Saints as patrons of specific diseases generally were chosen as such because of some appropriate miracle thought to have been performed during the life of that saint, or in some specific detail of martyrdom, or in a peculiarly tonal association of the name with that of the part or of the morbid condition. This association of names, so current among the more humble of the populace, was not to be found in the almost inaccessible, obscurely written, liturgical manuscripts, and it was not until the thirteenth century that Jacobus first integrated them into his "Golden legend." Ecclesiastical art visually portrayed the saints thus popularized and aids in interpretation not only of the supernatural legend with reference to ophthalmology but also, of the associated artistic masterpieces.

#### SAINT LUCY

Those suffering primarily with external diseases of the eyes invoke the aid of Saint Lucy, a virgin and martyr of Syracuse in Italy (Sicily). Historically, it is known that she was born into the nobility in about 283 A.D., of wealthy Christian parents. Her Italian father's early death left her dependent on her devoted Greek mother, Eutychia (or Eutitia). Lucy, as did many other early martyrs, desired to consecrate her chastity to God and worked constantly to devote her anticipated material wealth to the use of the indigent; however, her mother, who held control of the property, did not agree with this noble resolve until after her

chronic, intermittent vaginal bleeding had ceased while praying at the shrine of Saint Agatha in Catania where she had been taken by Lucy (Lucia). Brewer has given the story of this miracle in some detail: Lucy prayed to Saint Agatha to intercede for her mother and, while still in prayer, the saint appeared with heavenly angels and said, "Sister Lucy, why ask of me what you can yourself give unto your mother? Make your petition to God, for be assured if He loves me, He no less loves you also. If He will hearken to my prayers, so will He unto thine. If I am honoured as a saint here in Catanea, you shall be honoured as a saint in Syracuse."

Lucy found her mother restored to health and persuaded her to permit distribution of most of their wealth among the poor; however, the pagan youth to whom she had been unwillingly betrothed objected to this openhandedness and reported her unfavorably as a Christian to Paschasius, the governor of Sicily. She was found guilty and condemned to prostitution but she stood so immovable in the strength of God that even four oxen could not drag her from the spot where she stood (fig. 1). Further tortures and indignities then were forced upon her, but her faith in God still was so unswerving that her death finally was accomplished only when her throat was punctured by a sword. Baring-Gould pointed out: "... with Saints ... when everything else seems ineffectual to hurt them, cold steel breaks the charm." This is depicted in the Predella Panel: Martyrdom of St. Lucy (fig. 2). The symbolism of light as well as her attributes is portrayed by others (figs. 3 and 4).

Saint Lucy's most careful historians mention her blindness as one of her most grievous torments, but there is no documentation concerning the actual loss of her eyes. Mention of the latter does

not occur either in her "Acta" or in any of the earliest legends, but early artists expressed her name, Lucia (or *lux*), by placing an emblem of an eye, or eyes, near her in their works. Jameson not infrequently encountered such instances "of the convergence of the image or metaphor into a fact," and it is most probable that from such sources there developed the additional supporting incident or incidents in the history of her life.

Jameson also reports that many references exist with regard to the loss of Saint Lucy's eyes. This apocryphal narrative tendency apparently developed several centuries after her historic martyrdom. It is related, for example, that a young man of her acquaintance in Syracuse, although he expressed his deep love for her in every ardent fashion, found it unrequited. Her eyes had so captivated him that he was unable to think of anything else. Lucy felt not only that her vow of chastity was in danger but she also feared for the safety of her suitor and, bearing in mind the dictum of Christ, she plucked out her offending eyes (the method is not given) and sent them to the young man on a salver. He then, worthily enough and in atonement for the deep injury he had initiated, was converted to Christ and lived thereafter in virtuous chastity. However, it was not ordained that the pure and blessed Lucy should remain sightless; as proof of her courageous piety, her eyes suddenly were restored more pristinely beautiful than before as she knelt one day in prayer.

Saint Lucy, according to the many works dealing with the lives of the saints, is among the most illustrious of the virgin-martyrs and was so honored at Rome in the sixth century. Her feast day is celebrated annually by Latins and Greeks and by many warm-country Catholic peoples on the 13th of December, which





Fig. 1



Fig. 2



Fig. 3



Fig. 4



Fig. 5



Fig. 6



Fig. 7





Fig. 9



Fig. 10

Figs. 1-10 (Koch). Patron saints of the eyes.

Fig. 1. Scenes from the "Life of Saint Lucy: A miracle of the saint," by Jacopo Avanzo. Ancient fresco, Oratorio de S. Giorgio, Padua, Italy. (By courtesy of the Frick Art Reference Library.)

Fig. 2. Martyrdom of Saint Lucy; by (attributed to) Domenico Veneziano or, to (?) Pesellino. Predella Panel in Berlin Gallery, Berlin, Germany. (By courtesy of the Frick Art Reference Library.)

Fig. 3. Saint Lucy received into Heaven; by (attributed to) Niccola Grassi. Este-Duomo. (By courtesy of the Frick Art Reference Library.)

Fig. 4. Pieta, with Saints Lucy, Agatha, Petronius, and bishop Saints (who may be Clair or Augustine or both); by Arcangelo Aquilini. (By courtesy of the Frick Art Reference Library.)

Fig. 5. King Gustaf of Sweden and "Lucia" girl at Royal Tennis Club, Stockholm, Sweden, December 13, 1939. (By courtesy of European Picture Service.)

Fig. 6. Saint Odile (to left of mid-center) receives Castle Hohenburg from her father, Duke Eticho I. ("Hortus deliciarum," 12th century.) (By courtesy of Ciba Symposia.)

Fig. 7. Saint Odile (allegorical), with Saint John the Baptist, angel, and chalice; by I. Meck-nem. Burlington Mag., 1930, v. 56, April, p. 174. (By courtesy of the New York Public Library.)

Fig. 8. Saint Odile, with eyes on a book (missal). Gothic altar wing, St. Peters, Salzburg, Germany. (By courtesy of the New York Public Library.)

Fig. 9. Martyrdom of Saint Clarus; by Quentin Varin, in Les Andelys, Notre Dame, France. (By courtesy of the Frick Art Reference Library.)

Fig. 10. Saint Clare of Assisi (1194-1253), co-foundress of the Order of Poor Clares. (By courtesy of Mrs. E. T. Dehey.)

also is the festival of Saint Odile. This coincidence has given rise to some confusion. Saint Lucy, in a painting by Albertinelli which hung in the Munich gallery, is recorded in the German catalog as Saint Ottilia; however, the latter was an abbess and, in all devotional pic-

tures, properly is so represented. The 13th of December was a date known throughout the Middle Ages, especially in Western and Central Europe and in the Mediterranean countries, as the night of Saint Lucy, when demons and phantoms roamed the earth spreading illness.

She popularly was believed to spend that night annually dispersing evil spirits and warding off whatever malignancies they were perpetrating. Her feast, even today, is observed nationally in Sweden, a predominantly Lutheran country, when on that date a girl of each family, dressed all in white and wearing a lighted crown of candles, appears at dawn and offers coffee and "Lusia cakes" in honor of the saint who symbolizes the return of the light of day and the bringing of cheer (fig. 5).

Saint Lucy is the principal patron saint of Syracuse as well as of Alife, and she is a minor patroness of Palermo and of Mantua, Italy. She is invoked not only primarily against diseases of the external eyes but against ocular diseases in general as well as the loss of sight. She is believed also to protect against sore throat, epidemic diseases, dysentery, and any type of hemorrhage. The laboring poor, ploughmen, and tillers of the soil venerate her as their patroness. Her festival was celebrated as one of the second rank in England until the Reformation, and no work except tillage was permitted on that day. Swainson mentions in his "Weather folk-lore" with reference to the 13th of December, the day of martyrdom of Saint Lucy: "Lucy light, the shortest day and the longest night." Jacobo da Voragine, introducing his chapter on Santa Lucia, says: "Lucia means light. Now the aspect of light is beautiful for by its very nature it contains all classes. Hence we must understand that St. Lucia possessed the ornament of immaculate virginity; that in her was an outpouring of heavenly love without any impure passions. Her prayers went directly to God, and she passed the whole day in charitable works, without pause and without vexation. Or Lucia also means *lucis via*, a path of light." Blake writes: "There is a manuscript, written

in 1220, preserved in the dome of the Milan Cathedral, and cited by Gottofredo of Bussero, stating that Lucy took her name from 'light.' Cardinal Frederick Borromeo, in the sixteenth century, in his book, "On sacred paintings," mentioned a connection between Saint Lucy and the pagan divinity Lucini, who was also recommended for ocular troubles."

Artists and sculptors, great poets and writers, and even an explorer, have done homage to Saint Lucy and have added to her renown. Santa Lucia, an island in the Lesser Antilles, was discovered on the 13th of December and named by Christopher Columbus in her honor because, it is related, he had been cured of ocular trouble by her intercession; however, de Ybarra does not confirm this, although it is possible that chronic uveitis coexisted with the rheumatism (and not gout) from which Columbus suffered throughout his adult life.

The devout poet, Dante, professed such great devotion for Saint Lucy that he stated in the "Convivio" that he would name one city for Mary and the other for Lucy if he had a total of only two to name. He wept so copiously over Beatrice that Saint Lucy cured him when his eyes were affected. The light, exhilarative joy aroused by thoughts of Saint Lucy is expressed in the Neapolitan Boat Song, "Santa Lucia."

Many artists have portrayed Saint Lucy in many attitudes, media, and in a variety of styles. Details of her martyrdom; her emblems, the cord and eyes; the lamp symbolic of illuminating grace; the two eyes placed on a dish, a salver or on a missal held in her hand or situated nearby; the poniard, dagger, or sword; and the blessed palm of martyrdom are depicted individually or together in the various paintings, sculptures, glasswork, polyptychs, altar pieces, predellas, and bas-reliefs. The earliest works, as well as

those of later centuries, portray her holding a palm as the symbol of her martyred death for the sake of Christianity while the two eyes figure in some fashion more prominently in the later works. She consistently has been endowed in art with the character of celestial light and wisdom. Among those who have thus represented her are Tiepolo (in the Church of the Holy Apostles, Venice), Luca della Robbia (in bas-relief, over the door of the Church of Saint Lucy, Florence), Domenico Veneziano (in an altar piece in the same church), Barroccio, F. Angelico, Luca della Robbia (Church of Santa Maria a Ripa, Empoli, Italy), Carlo Dolce, Giovanni de Spagna, Lello da Velletri, Antonio Riccio, Parmegianino, Bernardino Luini, Antonelle Gagini; le Perugin, Lodovico Brea, Arcangelo Aquilini, Jacopo Avanzo, Pesellino, Angelico da Fiesole, Benedetto del Ghirlandajo, Niccola Grassi, Pietro Alemanno, Crivelli, Garofalo, Bartolo di Fredi Battilore, Lorenzo Costa, Gabriele Capellini, Domenico Ghirlandajo, and Lorenzo di Niccolo Gerrini.

#### SAINT ODILE

The recorded biographies of Saint Odile (Otilia, Odilia, Otilia, Othilia, Obdulia) are considered by Waite to illustrate the growth of a legend the romance elements of which have been woven about certain other basic facts that appear to him to have been fairly well authenticated historically.

There is in French Alsace a Mount Hohenburg which is said to have been a retreat of Alsatian Celts who protected it by a wall. It became a Roman camp for a time but, in the latter half of the seventh century, Adalric, Duke of Alsace, was in possession of this site on which a castle already had been erected. Adalric (Adalrich, Adalricus, Etic, Ettico, Aticus Etik—*Vatican spelling*), or the Alemannic

duke, Eticho I, was an imperious nobleman of his time who owed allegiance to his King, Childeric II, a reputed descendant of Archinould, Duke of Normandy, and a near kinsman of Dagobert the Great. Adalric married Bereshinde (Bereswinda, Berswinde), a relative of Saint Leodégar (Léger). The "Life" of Saint Odile (the "Vita" written in the tenth century), embellished with many legends, makes the claim that she was a niece of this saint. It is stated in the Catholic Encyclopedia that there exists a shorter text contained in a manuscript of the early eleventh century but that "internal evidences point to an original eighth century biography" although these are not specified.

A daughter who was born blind in about 660 A.D. was the first issue of the union of Adalric and Bereshinde. The enraged father lost no time in condemning her to immediate death; however, her mother secretly placed the infant girl in the care of an old female servant. Vision was reputed to have been bestowed upon her during adolescence, and, after parental reconciliation, she became a nun and the abbess of a convent which was actually the Castle of Hohenburg. She lived there for nearly a century and died in sanctity as a monastic saint.

The other recorded details of the narrative of Saint Odile are less well authenticated. She is said to have been transferred by her mother for educational purposes from the care of the old servant to the Convent of Baume-les-Dames, the Mother Superior of which was an aunt of Bereshinde. Despite her blindness she was instructed in learned matters and became a patron of intelligence and of piety although she never had been baptized. It was at this period of her life, when she was somewhere between the ages of 6 and 12 years, that Saint Erhard (Erard, Everard, Erhardt, Eberhard, Herard), a

bishop in the commissariate of Ratisbon, presumably fell into an ecstasy during which he received a call to proceed to Baume in the Rhineland to christen, by divine inspiration, a blind girl who was to be called Odile and who would receive sight with the sacrament. The promised miracle immediately followed baptism and, as she opened her eyes, according to Jacobo da Voragine, Saint Erhard said to her: "May you look at me thus in Eternity, my daughter;" or, according to Waite: "So, my child, may you look at me in the Kingdom of Heaven."

Adalric, shortly after the return of Odile's sight, was informed not only of the existence of a daughter whom he thought dead but, also, of the occurrence of the miracle. Accounts vary with reference to whether Saint Erhard was the purveyor of this news or if her brother, Hugh, had approached his father with the information. It is agreed, however, that Adalric, this unnatural parent, became very angry and not only refused Hugh's request that Odile be permitted to return home but he forbade any mention of her name. Hugh sent for Odile in spite of the parental edict and he was standing with his father on a neighboring small hill when she arrived in a carriage accompanied by a small crowd of local peasants. When Adalric learned the identity of the traveler and the manner of coming to his castle he fell upon Hugh and effected his immediate death. Adalric then turned, however, in immediate remorse to his daughter and, after gazing at her for the first time, became as affectionate as he had been cruel.

Odile came to prefer to live in quarters provided by her father at Obernai. It is inferred that she wished to continue the type of activity for which she had been trained. She lived and worked for several years at Obernai with a few recruited companions who joined her in devotions

and charitable works among the poor. Her father, upon her attainment to womanhood, arbitrarily arranged for her marriage to a German duke. Upon learning of this plan she fled, closely pursued, in beggar's clothes across the Rhine and, as she was about to be captured by her father at the Schlossberg near Breiburg in Breisgau, was forced to hide under a rock beneath a cliff face. This opened miraculously to her prayer and gave her refuge. Her father again was profoundly impressed by the evidence of another new miracle when the rock opened to liberate her, with a new healing spring issuing from the fissure. This spring is consecrated and still flows at Odilienberg (Hohenburg) where there is a long vista over the Rhine Valley, Alsace, and Baden. It still is visited by many pilgrims seeking not only the curing waters for their ocular troubles but, also, the intercession of Saint Odile. There also is to be found there a small chapel dedicated to her honor; however, it is not claimed that this is the same chapel that she is said to have had built on the spot in commemoration of the event when the rock gave her sanctuary.

When a reconciliation with her father was effected, consultations ensued, and she opened her heart to him, after which he permitted her to return to the family estates in complete freedom. She then expressed her desire to establish a convent of a community of nuns for the purpose of the literal practicing of the principles of the Gospel. He was prevailed upon to present to her from his various possessions his Castle of Hohenburg, situated behind Obernai. She altered the premises to suit her purposes and converted them into a convent to which Charlemagne granted immunity. This was confirmed on the 9th of March, 837, by Louis the Pious, who also endowed the Foundation. She became the abbess of 100 nuns and

added a great church, in the chapel of which she was buried.

Saint Odile established a rule of life, probably on principles of her own, in her convent, but there exists considerable difference of opinion, according to Waite, with regard to whether this was of her own devising, that of Saint Benedict, or that of Saint Augustine. Pilgrims travelled to the convent in increasing numbers, but the steepness of the mountain was a discouragement and an inconvenience; subsequently, she founded an auxiliary convent at a lower level on the eastern slope of the Mount (fig. 6). This she named Niedermünster and attached an inn, or hospice, to it.

Both her mother and father died in this convent during her long and useful life. She is said to have succeeded in rescuing her father from purgatory by receiving supernatural assurance that her prayers and penances for him had been answered. In about 720, on her deathbed at the age of 103 years, on the 13th of December, which, like that of Saint Lucy, is celebrated as her feast day, she was presented, it is related, with a chalice containing both elements of the Eucharist. She received it into her hands from a radiant angel in the sight of her nuns. It is implied by some authors of the lives of the saints that it was Saint John the Baptist who appeared to her and who also indicated at that time the site and dimensions for a chapel which he wished her to build in her honor. It is believed by others that this is more likely to have occurred at some time prior to that of her death, and this is indicated by the portrayal of Saint Odile and Saint John in an old work of Meckenem (fig. 7). The chalice remained with her after the communion and was placed in Hohenburg in 1546, in which year the abbey was destroyed by fire on the Vigil of the Assumption. The abbey was destroyed and rebuilt several

times subsequent to its first destruction. Some believed that the relics of this saint were preserved in spite of these events but the fate of the heaven-sent chalice is unknown.

The cult of Saint Odile grew, and she became the patron saint of Alsace. Hohenburg (Odilenberg), which later was said by the faithful to contain the relics of its first abbess, became a renowned mecca for holy pilgrimages. Saint Odile, who is invoked for ocular affections, usually is represented in ecclesiastical art with two eyes reposing on the pages of a missal, or prayer book, and her vestments are those of an abbess, by which she is readily distinguished from Saint Lucy, to whom is granted the same emblem together with a martyr's palm and who is also commemorated on the same day, the 13th of December (fig. 8). Baring-Gould has observed ambiguously that there may exist some difficulty between recognition and invocation of these two saints by reason of the narrative crediting Odile's miraculous acquisition of eyesight by baptism.

#### SAINT CLAIR

Saint Clair (Claire, Clarus, Clarius), whose feast is celebrated on the 4th of November, was a priest and martyr of the ninth century. He is invoked, chiefly in northern France, by those afflicted with inflamed eyes. Ophthalmia, according to Gordon, was known as Saint Clair's disease, but the term probably was employed generically rather than specifically. Saint Clair after having been elevated to the priesthood in England went to Normandy and lived as a hermit at Le Vexin (Vernon), in the Diocese of Rouen, adjacent to the Diocese of Beauvais.

There is much repetition of the name Clarus and of its derivatives in the several calendars, almanacs, and dictionaries. This may have been the result of carelessness by earlier compilers, or it may

have been due to the tonal association of names as well as to geographic inaccuracy. The French Benedictine, Usuard (Usuardus), according to the Benedictine Monks, of St. Augustine's Abbey, Ramsgate, placed the name of Saint Clair in the Roman Martyrology as of the ninth century. The English Menology, however, gives rather wide limits concerning the time during which he lived covering the period of 666 to 894. There is further confusion concerning actual dates because the Roman Martyrology in its chronological listing mentions a Saint Clarus whose feast is celebrated on the 8th of November and whose epitaph Saint Paulinus is said to have written. This Saint Clarus, who died a few days before his Master in 399, was a priest at Tours, an important community on the main highway to Paris from Nantes and Orleans.

Another Saint Clarus who is said, according to the Benedictine monks of St. Augustine's Abbey, to have been known to have lived and gained local fame in Normandy in the Middle Ages may very well be the Saint Clarus registered in the Roman Martyrology. Baring-Gould does not diminish the investigative difficulties by adding that Saint Clair occasionally is represented as a bishop, thus being mistaken for his namesake, Saint Clarus, a bishop of Mantes, which is a community situated between Paris and Vernon on the River Seine. Nor is it an aid to learn that there is still another Saint Clarus. The latter was an aged pagan priest at Roche-Guyon (upstream from Vernon on the River Seine), and he was converted to Christ by Saint Nicasius of Rouen after the former had been cured of blindness by the latter. The nature of the blindness is not specified, but Clarus later was ordained a priest and suffered a martyr's death (for reasons not recorded) with Saint Pientia of Roche-Guyon. Martyrdom occurred in approxi-

mately 311. The feast day of this Saint Clarus is celebrated on the 11th of October. And, lastly, there was a martyred Saint Clarus who was a bishop of Apt in southeastern France. He is the local patron against sore eyes and also the patron saint of tailors. His relics are in the parish church of Apt, where formerly his festival was celebrated on the 2d of January, but he now is honored also at Saint Cannot's Church in Marseille on the 9th of February.

In the interests of clarification some geographic mention should be made of northern France in the valley of the Seine. This is the region where the principal Saint Clair flourished, and this is fairly evident since the various compilers make similar mention of the several communities associated biographically with saints possessing this name. It seems most probable that there existed only one important Saint Clair who was invoked by those afflicted with inflamed or sore eyes, and it is his story that will receive particular attention here. It also may be observed that the name, "Clair," derives from the old French, meaning "clear," which, when usurped as a name for contemporary holy persons gained the further significance of spirituality of grace, gaze, and of mind. It is speculative whether Saint Clair chose his name in France or if he acquired it earlier in England. It was not an uncommon name in the France of his time, but it was not brought to England until the Norman baron, Walter de Bienfaite, of Clair (the treaty town of Clair-sur-Epte), in France, gave the name early in the tenth century to the English town now known as Clare.

Saint Clair was purported to have lived for many years a life of great seclusion and severity, in emulation of the Fathers of the Egyptian Deserts, after he had gone to Normandy from England to live



in the then province of Neustria. He is reputed to have led a hermit's existence near Coutances, south of Cherbourg, after which he became a monk at Maudun. He attempted, as a hermit, to teach true religion by word and precept to those among whom he lived, and he continued to follow these principles throughout his life.

He settled after long wanderings in Le Vexin, either in or near the Diocese of Rouen or that of Beauvais. The story of his martyrdom relates that he lived somewhere in the neighborhood of a lady of rank whose amorous advances he so frequently was compelled to repulse that it became necessary for him to take refuge in the forests in order to avoid revengeful death at the hands of two servants the spurned woman had sent to murder him. It is inferred that his eyes were of such beauty that he unwittingly caused the burgeoning of unrequited love in the unfortunate woman. His repeated flights ultimately, however, did not prevent his eventual beheading (fig. 9; see also fig. 4).

Saint Clair is among the few English saints represented in the famous wall paintings in the chapel in the Venerable in Rome. His martyrdom is appropriately symbolized, since he is represented as carrying his head with one hand while bashfully covering his eyes with the other as, presumably, was his attitude when the lady cast her admiring glances on him. Although Saint Clair is invoked throughout northern Catholic France by those with diseased eyes, there exists no available record of specific instances of ocular cures effected by his intervention.

It is necessary in connection with Saint Claire to digress briefly with regard to Saint Clare (Claire, Clara, Chiara, Cera) of Assissi, who was a virgin saint and foundress of the Poor Clares. She was born on the 16th of July, 1194, at Assis-

si, in central Italy, and took the vows of the ascetic life at the age of 18 years. She governed a community of nuns for 40 years, the last 27 of which she lived in illness. Pope Innocent III granted sanction for the privilege of extreme poverty and of living solely on the alms of the beneficent. It is from this custom that her order has ever since borne the title of the "Poor Clares." Her festival is held on the 12th of August, but she is celebrated only locally in Italy and in isolated communities elsewhere as a patroness against sore eyes. No specific instances of miraculous ocular healing are accredited to her; however, she is frequently depicted carrying or holding a lighted lamp (fig. 10).

#### SAINT AUGUSTINE

Saint Augustine (Augustin, Aurelius), Confessor and the Bishop of Hippo Regius, was born on the 13th of November, 354, at Tagaste in Numidia. He is included by name in the Canon of the Roman Mass in Gaul and in the Mozarabic Mass of Spain. The Greek Church does not honor him, but he is commemorated in the Russian Church on the 15th of June. His festival is celebrated on the 28th of August, in accordance with the listing in the Roman Martyrology, and the Augustinian's keep his feast day as a double minor of the first class. He is the patron saint of theologians, printers, and brewers, and he is invoked against sore eyes, primarily among the Germanic Catholic States, but medical historians make no specific mention of this.

His impulsive nature as a youth led him, according to the various compilers, into an active life of vice, and it is considered that, in religion, he also went astray; however, from having been Hearer in the Manichaean sect, he ultimately proceeded to Rome and, thence, to Milan to teach rhetoric. The successive study of



Neo-Platonic writings, the summons of Saint Ambrose, and the Epistles of Saint Paul served to bring him nearer to the Church. His conversion is related very graphically in his "Confessions." After his baptism on Easter, in 387, and after a life replete with so many moral and intellectual errors, he began to live the life of a saint. He returned to Africa, was ordained a priest and, then, appointed preacher at the Church of Hippo Regius in 391 A.D. He was elected Bishop of Hippo in 395 and died there on the 28th of August, 430.

The significance of Saint Augustine's name is similar to that of the other saints who have been discussed, and the ocular implications are identical. This saint, however, while credited with many miracles of a common type as well as some special types, receives no mention in the available sources with reference to the performance of miraculous cures of eyes in ill health; but he has been represented in ecclesiastical art in association with Saint Lucy and, questionably, with Saint Clair (fig. 3). Saint Augustine's life is well documented, and it may be for this reason alone that there exists little in the way of hagiographic legends concerning him, but it seems more acceptable that this lack is sequential to his intellectual stature and to the austerity that permitted little, if any, romantic appeal.

#### COMMENT

The almost universal need in times of stress for assistance greater than that commandable by the average person from within himself has eventuated through the ages in the evolution of a common,

basic, supernaturalistic zenith, the form of which in the main has retained its familiar essentials from era to era but whose outward embellishments have varied with the dictates of the changing environmental forces whether antiquarian, pagan, or Christian. The interpretation of this known reliance in a higher power, but less than that of the Almighty, necessarily is expressed by each individual in terms of his own ambitions and endeavors; however, it should be the concern of those who administer to his biologic and spiritual requirements, real or apparent, not only to appreciate understandingly the factors productive of bodily ill health but, also, the equally important, more involved personality components that determine individual reactions and attitudes toward dysfunction and afflictions.

Faith in a belief, as one of these components, particularly requires sympathetic evaluation. It is not advocated that this faith be recommended as an agent of healing, whether by implication or by direction, but passively it may be utilized beneficially to promote an increased sense of well-being. If the practitioner is at all familiar with the basis of the beliefs encountered, and these are found so often among the members of our still unassimilated racial population groups, his therapeutic endeavors will undergo no deterioration if he does not deprecate the known but quiet need of the many for the supportive spiritual comfort that derives from a belief in the intercessory powers of the saintly martyrs.

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# OCULAR THERAPY WITH PENICILLIN USED TOPICALLY, INTRAOCULARLY, AND SYSTEMICALLY

WITH CASE REPORTS

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The use of penicillin in the Brooke General Hospital since August, 1943, has shown the wisdom of following certain standard procedures. The following of these general procedures, as originally laid down by the director of penicillin therapy, Lt. Col. Richard B. Grant, Jr. (MC), has had the advantage of allowing the entire staff of the Brooke General Hospital properly to evaluate the results of the drug's use; the value of a director has resided in the fact that a stable drug has been used under standardized procedures. To have worked with a potentially unstable drug such as penicillin, which varies as it does in its potency, would have led to poor results in cases where the need for it was demanding and trying. Supervision overcame this factor.

With a penicillin of known strength, freshly prepared, and potency secured by keeping the solutions in a refrigerator, and checked against culture plates of known bacterial strength, the following procedures were followed and illustrate three modes of administration in ocular conditions; namely, (1) topically, (2) intraocularly, and (3) systemically or intramuscularly. It should be mentioned that penicillin therapy was limited to the most severe conditions. Intravenous therapy, reserved for the most acute of cases, was not resorted to, for in the words of Florey<sup>1</sup> "It is like pouring water down a basin with the plug out."

The following cases from Brooke General Hospital were followed by various members of the ophthalmologic staff:

## TOPICAL USE OF PENICILLIN

CASE 1. A private from a cavalry post, aged 23 years, colored, reported that he

had been injured on January 16, 1944, when a beer bottle struck him in the face. He was immediately taken to his station hospital, where his injuries were listed as: (1) traumatic rupture of the left eyeball; (2) lacerated wounds of both upper lids, severe, and also of the left lower lid; (3) lacerated wound of the dorsum of the nose, mild; (4) lacerated wound of the sclera of the right eye, severe; (5) lacerated wound of the upper lip. The lacerations were all sutured with silk, except those involving the left eyeball, which was not repaired because of its severity. On January 17, 1944, the patient was transferred by ambulance to the Brooke General Hospital.

*Physical examination* on admission to Brooke General Hospital: The patient was in no evident pain; both eyes were bandaged, and the multiple lacerations of the face were well approximated. *Ophthalmic examination*: The lids could be opened, but were edematous. Visual acuity in the right eye sufficed only for finger counting at nine feet; the left eye was blind.

*Right eye*. None of the lid lacerations involved the entire thickness of the lid. Inspection showed that the laceration of the conjunctiva and sclera in the lower nasal quadrant was three-quarters inch long, running like a crescent three-eighths inch from the limbus down toward the cul-de-sac. Both conjunctiva and sclera were sutured together by three silk sutures in such manner that there was pouting and distortion of this segment of the globe anteriorly; discharge of a mucopurulent nature was present at the suture line. The cornea bore a thin, straight laceration, three-eighths inch long, run-

ning 3 mm. vertically down from the limbus at the 1-o'clock position. Moderate ciliary congestion was present. The anterior chamber was normal in depth; the pupil, dilated, did not react to light; the iris indicated no pathologic change; no prolapse was evident; a cortical opacity was observed in the upper half of the lens. The fundus could not be seen. Tension was normal by finger palpation. The slitlamp was not used, since this was a bed patient.

*Left eye.* None of the lid lacerations involved the entire thickness of the lid. The external canthus bore a large laceration, which curved down and out, enlarging the palpebral fissure. The globe was hopelessly ruined by three lacerations and was collapsed.

*Progress and Treatment.* A stimulating dose of tetanus toxoid, 0.5 c.c., was administered subcutaneously. A smear from the site of the laceration showed no organisms. One minim of 3-percent atropine-sulfate solution was instilled into the right eye twice daily. With the left eye destroyed and the right eye endangered by a corneal laceration, a traumatic cataract, and a severe scleral laceration, all efforts were directed to saving this eye. Accordingly, a fresh solution of penicillin was obtained for local therapy; this solution was made biweekly in the strength of 250 units of penicillin per cubic centimeter dissolved in an isotonic solution of sodium chloride; two drops were instilled into the right eye every 30 minutes, day and night, for 21 days. Between treatments sterile 4 by 4 pads were kept over the right eye at all times, in this manner securing a wet dressing of penicillin solution. The left eye was treated twice daily with 20-percent silver protein mild instillations.

On January 20, 1944, the right eye had vision estimated at finger counting at five feet; the ciliary injection was less in

amount. The tactile tension remained normal. Observation of the lens showed that its pathologic change had fortunately not advanced; the scleral laceration still appeared dangerous, with its pouting edges and the overlying mucopurulent exudate.

On the following day, enucleation of the left eye was performed, with implantation of glass ball, under intravenous sodium-pentothal anesthesia. Recovery was uneventful.

On January 22d, it was decided that the silk sutures of the right eye should not be removed, because of the danger of opening the scleral laceration. The site of the laceration showed much less exudate. Penicillin therapy was continued by topical instillation. The blood Wassermann test was reported positive on this date and in consultation a diagnosis of syphilis was made, late and latent, noninfectious.

On January 23d, vision in the right eye remained at finger counting and was improved slightly by lifting the head up and to the left. The pathologic change in the lens had fortunately not proceeded to complete opacification. The laceration of the sclera had healed, but there remained a deformity of this area disturbing the normal contour. The silk sutures had separated and were removed from the lower cul-de-sac. The left socket showed complete healing.

On February 8th, after penicillin therapy had been administered locally for 21 days, no signs nor symptoms of infection of the right eye were present. The soldier was therefore transferred to the Valley Forge General Hospital, an ophthalmic center, for further surgery and the learning of Braille.

*Comment.* In the writer's opinion, the instillation of penicillin into the right eye prevented further spread of infection through the scleral laceration. It may be argued that no organism was found by

smear; this is true. It may also be argued that the exudate was the normal response to tissue necrosis, produced by the sutures; however, the changes observed in the exudate and its gradual change to a mucopurulent nature in 48 hours and then its gradual decrease made us feel that penicillin was a definite help in preserving this one eye. The systemic use of penicillin in this case would be contraindicated, as previous writers have definitely shown that intramuscular penicillin is not excreted into the tears.<sup>2,3</sup>

**CASE 2.** An infantry sergeant, 35 years old, white, was admitted to the Brooke General Hospital on October 5, 1943, with the complaint of severe, burning pain in both eyes of one week's duration. He had been treated at the eye clinic as an out-patient for one week with no relief. On hospital admission, the results of the general physical examination were negative.

*Ophthalmic examination.* Both eyes showed marked congestion of the entire ocular conjunctiva, most evident in the bulbar portion. Strings of pus were present in the cul-de-sacs. Fluorescein instillations showed no ulceration of the cornea. Vision was 20/20, J2-13 bilaterally. A culture and smear were taken; both showed a nonhemolytic *Staphylococcus aureus*. For the following 10 days, various treatments were tried without improvement. On October 15th, minute ulcers of the corneas had developed; these were superficial and involved the periphery of the corneas. Atropine and hot packs were started. On the following day, the condition had involved more areas of the corneas. The illness had now lasted 17 days. Penicillin topical therapy was started; the solution in the strength of 250 units per cubic centimeter was instilled into each eye every half hour, day and night; between treatments the eyes were kept bandaged.

*Further progress.* On the 18th of October, definite improvement was observed. The ulcers had not extended in size or number, and there was less discomfort and much less conjunctival secretion. Two days later, there was only faint corneal staining, with but little secretion from the conjunctivas. Subjective improvement also was evident. On October 22d the ulcers were healed, as evidenced by no staining of the corneas with fluorescein; all secretion was now absent. On October 23d, penicillin therapy was discontinued. Vision was 20/20 bilaterally.

*Comment.* Rapid relief of pain and resolution of inflammation without any harmful effects were produced in this case, in which *Staphylococcus aureus* was found. This would be expected as the staphylococci are one of a group especially susceptible to penicillin. Other writers<sup>3-6</sup> have reported its efficacy in conjunctival or corneal lesions.

#### INTRAOCULAR USE OF PENICILLIN

A private from a cavalry unit, aged 31 years, colored, gave the history of having injured his left eye with baling wire while loosening a bale of hay on September 23, 1943, at 4:00 p.m. He presented himself the next day to the eye clinic of his station hospital, and the notes of the chart read that, "the conjunctiva was injected; the cornea was perforated in a curvilinear manner for 4 mm. at the 3-o'clock position near the limbus; iris protruding." An iridectomy under local cocaine anesthesia was performed on that date. The progress notes from September 24th to October 4th revealed that the vision in the left eye was light perception, and in the right eye 20/15. On October 4th, the cornea of the left eye was described as "foggy" with some injection of the conjunctiva. On the following day, the soldier was transferred to Brooke General Hospital. Admission examination revealed the pres-

ence of much ciliary congestion in the left eye; the tension was normal, but the globe was very tender; the pupil was small and deformed as the iris was incarcerated in the wound at the limbus at the 3-o'clock position. The general physical examination was negative. Laboratory reports showed erythrocytes 4,100,000; leucocytes 7,700; hemoglobin 80 percent; polymorphonuclears 50 percent; lymphocytes 50 percent; clotting time 5 minutes; and bleeding time 2 minutes, 30 seconds. The urinalysis showed many white cells; no urethral discharge was present. The Wassermann test was negative as was the Kahn test. On the 8th of October, an iridectomy was performed with a conjunctival flap, under intravenous sodium-pentothal anesthesia.

*Progress notes and subsequent therapy.* On the third postoperative day the left eye was comfortable; tactile tension normal. Atropine was prescribed, to be instilled twice a day.

October 16, 1943. Tension in left eye was normal; the corneal edema less; the eye generally was progressing nicely. The sutures were removed from the conjunctival flap.

October 20, 1943. Tactile tension was normal, but much ciliary congestion was present. Although the patient did not complain much, it was evident from observation that there was constant discomfort. The cornea was edematous. A dose of 25 million organisms of typhoid vaccine was injected intravenously.

October 25, 1943. The eye remained the same; it was totally blind.

November 4, 1943. More pain was present in the left eye, with much ciliary congestion. There were many cells in the anterior chamber and heavy deposits on Descemet's membrane; the dose of typhoid vaccine intravenously was repeated. Two ophthalmologists agreed that enucleation would eventually be necessary.

November 5, 1943. Examination on this

date showed vision, O.D. 20/20, J1 at 13"; O.S., nil for distance and near. Ciliary congestion was great. The cornea of the left eye was clear, but its posterior surface contained very many deposits, which could easily be seen macroscopically, and the deposits formed a rather bizarre picture, simulating a culture growth on the posterior surface of the cornea. There was no hypopyon, however. With the slitlamp, the iris details could not be seen owing to the thick deposit. The fundus, of course, could not be seen, even with the binocular ophthalmoscope. It was recommended that a paracentesis of the anterior chamber be performed with an attempt to irrigate the deposits with penicillin. The operation was performed under sodium-pentothal intravenous anesthesia. The left eye was fixed with fixation forceps. A sharp, 23-gauge needle, one inch long, attached to a tuberculin syringe was inserted into the anterior chamber at the limbus at about the 2-o'clock position in such manner as to lie over the iris and still be away from the anterior lens surface; withdrawal of the barrel was done slowly, until 0.25 c.c. of the aqueous was withdrawn. Collapse of the anterior chamber was quite evident at this point. The syringe was detached carefully from the needle and another syringe, containing 250 units of penicillin per cubic centimeter, was attached to the needle and 0.25 c.c. was injected into the anterior chamber. The latter re-formed, and it was observed that the deposits on the posterior surface were swept off by the inflowing penicillin. The needle was withdrawn and the eye bandaged. A culture of the aqueous was made; also, some was injected into the anterior chamber of a rabbit's eye in the hope of finding a causative organism, but both of these cultures were reported negative after 48 hours.

November 13, 1943. The first postoperative dressing showed that the eye was white! This unexpected result, with

subjective comfort, was pleasing. There was no ciliary congestion. The cornea was clear; the anterior chamber was reformed; the iris details could be seen, and a few individual deposits were present on the anterior surface of the lens. However, with clearing of the anterior chamber, a clear view of the vitreous was possible and an object, moving with the movement of the globe, was seen. This, apparently was a massive detachment of the retina and accounted for the blindness of this eye.

November 15, 1943. A thorough intraocular examination was made on this date, and the diagnosis of massive retinal detachment was verified. Slight ciliary congestion was present.

November 17, 1943. The eye was not so red, and the tension remained above normal.

November 24, 1943. The patient was discharged to limited service with a preserved globe and a quiet eye. The tension was normal, vision nil.

*Comment.* It is interesting to review the hospital confinement in this case. Immediately after his penetrating eyeball injury, the patient was hospitalized for a period of 10 days at his station hospital; at the general hospital he had spent five weeks up to the time of operation. After the intraocular injection of penicillin, the eye became white in 48 hours, and the soldier was discharged from the hospital 11 days later. It is believed that the injection of diluted penicillin solution into the anterior chamber definitely saved this eyeball, although vision remained nil.

#### SYSTEMIC USE OF PENICILLIN

An aviation student, white, 25 years of age, was transferred to Brooke General Hospital on March 24, 1944, from a distant station hospital. The pertinent history stated that "while he was on duty in a skeet tower at his airbase, he received an injury to the left eye, caused by a

stray pellet from a skeet gun (12-gauge with no. 8 shot), on the 21st of March, 1944, at about 2:30 p.m." A complete physical examination was negative except for the injury to the left eye. The vision in this eye was down to perception of hand movements. There was a round perforation of the left eyeball, 4 mm. below the inferior border of the limbus at the 5-o'clock position. No vitreous was presenting. Atropine was instilled at this time and a dressing applied. On March 22d, ophthalmologic examination was made: "inferiorly toward the 6-o'clock position is a vague, rounded mass, which may be the foreign body, or a localized vitreous hemorrhage, caused by the impact. Pupil is only slightly dilated. There is marked conjunctival edema, laterally. The vision today is finger counting." A radiologic report on this date stated: "there is seen a small metallic, foreign body in the left orbit in the left lower outer quadrant; on the lateral view it was found to be resting well in the orbit, but had not penetrated the cranium or sphenoid sinus."

On admission to Brooke General Hospital, March 24, 1944, the ophthalmologic examination showed the vision to be: O.D. 20/15—, J2 at 13"; O.S. light perception could not count fingers at 10 inches. The finger tension was found to be normal in both eyes. The right eye was normal throughout.

The left eye showed marked ciliary congestion. The site of the perforation was still evident in the area mentioned. Slitlamp examination revealed an increased flare of the aqueous; there were no keratitic precipitates on the posterior surface of the cornea. No opacity was seen in the lens. With the ophthalmoscope, a dull, red reflex was observed; and many large vitreous floaters; the lower half of the vitreous was completely dark and nothing would be seen. Localization of the foreign body by X ray was performed with the Sweet localizer. This

revealed the presence of a spherical foreign body, 2 mm. in diameter, 34 mm. behind the cornea, 9 mm. below the horizontal plane, and 5.5 mm. to the nasal side of the sagittal line.

Laboratory work on admission showed: red blood cells, 4,360,000; hemoglobin, 80 percent, white blood cells, 7,950; polymorphonuclears, 66; lymphocytes, 22; mononuclears, 8; eosinophiles, 4. Urinalysis was completely negative. Sedimentation rate, 0-2-9-18 mm. in one (1) hour; hematocrit, 41; plasma protein, 6.8 gm. per 100 c.c. Kahn, negative; coagulation time, 3'15"; bleeding time 1'45".

*Progress.* March 25, 1944. The left eyeball was intensely injected; the vision remained at light perception. The patient this morning stated that for the first time the left eye was paining him. The pupil was well dilated. Blood was seen in the lower part of the anterior chamber, which was very deep. The media were definitely more cloudy today. One cubic centimeter of tetanus toxoid was given as a stimulating dose. An injection of 25 million organisms of typhoid vaccine was given intravenously for its foreign-protein effect. It was evident then, from the reports given, that there was a double perforation of the eyeball, caused by the pellet in its entrance and exit at 34 mm. from the cornea.

March 27, 1944. Subjectively, the patient was complaining of more pain in the eye. There was no edema of the lids, but there appeared to be more lacrimation. Vision was reduced to light perception. No fundus reflex was obtainable. The possibility of detached retina was being borne in mind; also the fact that traumatic injury was created at the point of exit of the pellet and possibly also behind the globe. Foreign protein was again administered in the form of 25 million organisms of typhoid vaccine intravenously.

March 29, 1944. The patient was requesting frequently, doses of medicine for

pain in the eye. Edema of the upper lid was present.

March 30, 1944. Penicillin solution was injected on this date into the anterior chamber of the left eye, with the patient under intravenous sodium-pentothal anesthesia. The white count was increased at this time to 10,050 with 66 percent polymorphonuclears. The same penicillin-injection technique was used as in case 2. In this case, however, 0.5 c.c. of aqueous was withdrawn, for, as mentioned previously, the anterior chamber was very deep, and 0.5 c.c. penicillin solution was injected.

March 31, 1944. Edema of the lids was less than on the previous day; subjectively, the patient has not complained of so much pain as previously.

April 1, 1944. Examination of the eye showed that there was slight edema of the left upper lid, also the same amount of congestion as previously (increased possibly by fixation forceps and needle trauma). The cornea was clear, the anterior chamber was very deep, with no hypopyon or blood; the pupil was dilated. In order to give this eye every possible chance, penicillin was ordered to be given intramuscularly to combat the endophthalmitis and possible retrobulbar infection. An intravenous injection of 40 million organisms of typhoid vaccine was also to be administered, for the previous administrations did not raise the mouth temperature beyond 100.8°. A smear from the aqueous was reported: "No bacteria are found, and a 48-hour culture of the aqueous shows no growth."

Therapy consisted of instilling one drop of 3-percent atropine-sulfate solution into the left eye once daily and hot compresses to the eye three times daily. The intramuscular or systemic use of penicillin was started on April 1st by injecting 25,000 units every three hours day and night, and this was continued for 42 days.

By the 4th of April, the patient was

more comfortable and he stated that he could see light and shadows temporally. The ophthalmoscope still revealed no retinal reflex. The edema of the lid had disappeared completely. The white blood count on this date was 8,300; hemoglobin, 80 percent; the differential count was 68 percent polymorphonuclears, 31 lymphocytes, and 1 monocyte. The plasma protein was 6.6 percent.

On May 12th the penicillin therapy was discontinued and the condition of the eye was as follows: Vision remained at light perception; a faint ciliary flush persisted; the cornea was clear; there were a deep anterior chamber, a slight fundal reflex superiorly and nasally, and a grayish mass, slightly movable, could be seen above, which undoubtedly was a detached retina.

When intramuscular injections must be repeated frequently, it is important to keep the volume as low as possible in order to avoid local discomfort at the site of injection—the usual practice has been to employ a concentration of 5,000 units per cubic centimeter of isotonic solution of sodium chloride.

It is also well to remember to give large initial doses of penicillin, because bacteria may become "penicillin fast" with small doses. The amount to be given will vary with the individual case, as many as 6 million units having been given a month in some cases; it will vary with the type of severity of infection. It is suggested that the adequate dosage, although not

clearly defined, be kept around 200,000 units daily. The intramuscular route is the usual route<sup>5</sup> by which this drug is administered. It should be given into the muscle and not into the subcutaneous tissue; its use in ocular conditions is similar to that adopted in other systemic infections.

*Comment.* This eyeball was definitely saved by the systemic use of penicillin. Edema of the upper lid is in itself always a serious sign whether it denotes an endophthalmitis or an orbital cellulitis. The intramuscular use in this case was prolonged, perhaps, but considering the seriousness of the condition, was justified. We have had no untoward reaction from the use of penicillin in our eye cases; urticaria, transient azotemia and eosinophilia were watched for.

#### SUMMARY

1. Penicillin is a wonderful new therapeutic agent which can safely be added to the armamentarium of ophthalmologists.

2. Penicillin can be utilized in the three ways demonstrated in the foregoing case reports.

3. The use of penicillin by injection into the anterior chamber offers promise of beneficial results, and this mode of therapy warrants further investigation.

The writer is indebted to Lt. Col. Richard B. Grant, Jr. (MC), A.U.S., Director of Penicillin Therapy, for his ready advice in the treatment of these cases.

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## SEROLOGIC STUDIES IN ACUTE EYE DISEASES\*

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It has been stated that the sera of patients affected by an acute febrile illness as, for example, pneumonia, tonsillitis, sinusitis, and acute upper respiratory infections, will produce a swelling of the capsule of Type XXVII pneumococcus.<sup>1</sup>

It was decided to apply this simple test to the sera of patients who had various eye lesions with or without febrile reactions. If it were possible to demonstrate the nonspecific capsule (N.S.C.S.) swelling, one might postulate that the etiology of the ocular pathology was due to a hidden focus of infection.

It is well known that the pneumococcus contains three different chemical constituents; namely, (1) type-specific polysaccharide A, (2) the nontype-specific nucleo-protein B, and (3) the somatic C fraction. The last named of these, according to Tillett, Goebel, and Avery<sup>2</sup> is different chemically and immunologically from the first two, and is sometimes known as a nonspecific carbohydrate.

By using this nonspecific carbohydrate in concentrated form, R. Ash<sup>3</sup> concluded that precipitants for the pneumococcus were present not only in pneumococcic infections, but also in illnesses due to the gram-negative as well as to the gram-positive organisms. Syphilitic infections did not produce this phenomenon, nor did it generally appear in tuberculous disease, or, if it did, only in small amounts.

Normally, the sera of healthy humans do not produce capsular swelling, judging from the work of G. Lofstrom<sup>1</sup> in 1939, who stated that the sera of 120 healthy recruits in the Swedish army did not produce the reaction with the pneumococcus;

but he found that it was positive in one third of 157 soldiers who had an upper-respiratory infection, and that this percentage was independent of the elevation of the body temperature. The reaction became negative between the sixth and the twelfth day in 12 cases running a smooth course. But the cases either ended fatally or developed complications in others wherein the reaction remained positive.

In an attempt to correlate the foregoing observations with the responses to be found in acute inflammatory eye conditions, 5 to 10 c.c. of blood were collected from each of the 16 patients tabulated. Sera were separated and stored in the refrigerator until all were on hand. The routine Neufeld type of pneumococcus typing reaction was done with all sera. The pneumococcus Type XXVII used was obtained from the American Type Culture Collection and when received had a very small capsule. However no animal passage nor other method of enhancing capsule size was attempted, as it was felt that sufficient material was present for observation of swelling. Observations of mixtures to determine swelling were made (1) at once, (2) after four hours at room temperature, and (3) after overnight storage in the refrigerator.

Case 13 not only exhibited swelling of the capsule, but also microscopic agglutination. The Type II pneumococcus that was recovered from the tonsillar material probably represents only the predominant type, and Type XXVII may have been present, but missed.

In using this test on 16 cases exhibiting acute inflammatory eye lesions, it was found positive in one of seven patients with iritis, positive in one of four cases

\* From the Department of Ophthalmology, Washington University, and the Oscar Johnson Institute.

TABLE 1

DATA FROM 16 CASES OF OCULAR DISEASE IN WHICH THE LOFSTROM TEST WAS USED

No.	Pt.	Diagnosis	Day of Disease When Tested	Age	Sex	Race	Amt. of Typhoid I.V.	Organism Found	Non-spec. Cap. Swell.	Remarks
1	M.F.	Iritis, O.D.	10 days	34	F	W	0	none	—	Cause undetermined
2	M.S.	Iridocyclitis, O.S. choroiditis	30 days	30	F	W	85 M	none	—	Possibly due to chronic tonsillitis
3	E.B.	Uveitis, O.U.	18 days	3	M	W	0	none	—	Granulomatous—probably tbc. Sequelae exanthem—blind in O.U.
4	R.R.	Dendritic ulcer	21 days	56	M	W	0	none	—	Cured with one thermophore treatment
5	B.C.	Uveitis, O.U.	9 mos.	32	F	C	0	none	—	Positive tuberculin (.0025 mg.) skin test, 1 tooth abscessed. Chronic tonsillitis—probably tbc.
6	R.W.	Iritis, plastic, O.D.	9 days	28	M	W	0	none	+	Gonorrheal iritis
7	J.H.	Corneal abscess	14 days	43	M	W	0	none	—	Foreign body removed, abscess followed
8	V.A.	Recurrent Iritis, O.S.	7 days	25	F	W	0	none	—	Chest X ray for tbc. positive. Positive 2d strength P.P.D. (½ dose) (.0025 mg.)
9	K.G.	Iritis, O.D.	3½ mos.	61	F	W	0	none	—	Ariboflavinosis; edentulous. Inactive pulm. tbc.; etiology probably tbc.
10	M.A.	Chorioretinitis juxta papillaris	7 days	24	F	W	0	none	—	Cause undetermined
11	H.F.	Hypopyon ulcer	8 days	57	M	W	before & after 50 M	none	—	From thorn. Treatment with thermophore and sulfadiazine
12	T.R.	Corneal abscess	8 days	16	F	W	1000 M	none	—	From broken glasses. Treatment with penicillin locally, X ray, and sulfadiazine
13	G.S.	Choroiditis	35 days	21	F	W	400 M 3 wks. ago	pneumo. strep. staph.	+	See case discussion
14	E.P.	Central choroiditis, O.U.	7 days	33	F	W	0	none	—	5 mos. pregnant
15	W.S.	Choroiditis, O.S.	42 days	39	M	W	0	none	—	Cause undetermined
16	L.H.	Optic neuritis, O.U.	22 days	43	F	W	0	none	—	Probably due to hair dye

with chorioretinitis. This test was negative in two cases of corneal abscess, one case of dendritic ulcer of the cornea, and one case of optic neuritis. Out of this group, the nonspecific capsular swelling was not present in three cases in which the patient had received artificial fever from the use of intravenous paratyphoid-typoid vaccine. The two cases which showed a positive reaction were as follows:

Case 6. R. W., a white man, aged 28 years, entered the hospital on the ninth day of his illness with an acute unioocular plastic iridocyclitis. He gave a history of an acute Neisserian urethritis eight years

ago, followed in a few months by an acute arthritis of the right knee. During his hospitalization the complement fixation for gonorrhea was positive, but the prostate was negative for pus. X-ray studies of teeth and chest were negative. Kahn, urine, and brucella agglutination tests were negative. Diagnosis in this case was gonococcal iritis. The patient's serum gave a positive reaction to Type XXVII pneumococcus. Treatment was successful with sulfathiazole and the Kettering hypertherm. It has not been possible to obtain a follow-up reaction of his blood.

Case 13. G. S., a white woman, aged 21 years, had an extensive chorioretinitis

and optic neuritis with an eccentric vision of 6/60. She was given a four-day course of sulfadiazine. An adequate blood level was obtained, but this was stopped because of nausea and vomiting. A total of 400 million paratyphoid-typhoid vaccine was given intravenously on four separate days, but the choroiditis continued to advance. She showed a moderate amount of keratitic precipitates and a few cells in the anterior chamber. X-ray studies of her teeth and chest were negative. Cervical examination by a gynecologist was negative. Agglutination for brucellosis, Kahn, typhoid, tularemia, and urine tests were entirely negative. The otolaryngologist thought her sinuses were normal and that her tonsils were not involved enough to warrant removal unless no other cause could be found. On the thirty-fifth day of her illness, just the day prior to the tonsillectomy, the serum produced a capsular swelling of Type XXVII pneumococcus with microscopic agglutination. One week postoperatively the eye lesions (uniocular) were the same, but the N.S.C.S. test was negative. Two weeks postoperatively the serum still remained negative and the eye lesions had improved in that there were no more hemorrhages, less retinal edema, no cells in the anterior chamber, and only a few mutton-fat K.P. remained. It was interesting to note that her tonsils cultured Type II pneumococcus, streptococcus, and staphylococcus. Her vision to date remains 6/60 eccentrically.

Four patients in this group, thought to have tuberculous uveitis, showed no non-

specific capsular swelling. This tends to confirm the work of Ash<sup>3</sup> in tuberculous disease, who used the concentrated C fraction.

It is realized that only a few cases are reported here and for this reaction to be of further significance a greater number of cases should be studied. It is not an expression of wishful thinking to state that if a serum produces a positive reaction, the etiology for the eye lesion is likely to be found in a focus harboring the causative organism.

Just as Lofstrom<sup>4</sup> claims that one may use his test (nonspecific capsular swelling of pneumococcus) in differentiating a bacterial meningitis from a virus meningitis, in that it is positive in the former and negative in the latter, an ophthalmologist might differentiate an iridocyclitis or choroiditis due to a bacterial agency or any other etiologic agent as an allergin or a virus.

#### SUMMARY

1. The sera of 16 eye patients were used in the manner of the Neufeld test to determine the presence of an agency that would produce a nonspecific capsular swelling of Type XXVII pneumococcus.

2. Two cases showed a positive reaction.

3. The etiology of these two cases was determined to be an organism in the gram-negative or the gram-positive groups.

4. After removal of the cause of the choroiditis, the test became negative.

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# NOTES, CASES, INSTRUMENTS

## INTRAOCULAR INJECTION OF PENICILLIN IN OCULAR INFECTIONS

### PRELIMINARY REPORT

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*New York*

The purpose of the present paper is to report the comparative results obtained in the treatment of two cases of corneal ulcers with hypopyon, one having been treated with intraocular and subconjunctival injections of sodium penicillin, the other solely by subconjunctival injections of sodium penicillin.

The information I was able to gather before I started the penicillin therapy was meager, especially in regard to the concentration of this drug and to the best route of administration, investigations and reports on this subject being at the time almost nil. The two common methods of administration of penicillin, intravenous and intramuscular, were discarded from the beginning, for it was thought that a direct application would be more effective and beneficial than the intravenous and intramuscular injections, which generally are given at very frequent intervals.

In case 1 an injection into the anterior chamber of 50 Oxford units of sodium penicillin was followed by subconjunctival injections, whereas in case 2 only subconjunctival injections were used. Both cases were complicated by other pathologic changes; namely cataract in the first and absolute glaucoma in the second.

### REPORT OF CASES

*Case 1.* M. F., a man, aged 70 years, was first seen in my office on April 17, 1944, because of an ulcer of the cornea

of the right eye. Vision, O.D., was perception of hand movements; O.S., 20/70. For about eight days he had been treated by a private physician who had cauterized the ulcer and had advised atropine instillations, sulfathiozole ointment, and hot compresses, but with no apparent results.

Examination showed an infiltration of the cornea of the right eye from the central and nasal sector to the lower part, extending about 4 mm., a severe conjunctivitis, and perikeratitic injection. The rest of the cornea was hazy. The slitlamp examination showed an enormous number of cells in the aqueous and a small half-moon of exudates in the lower part of the anterior chamber. The pupil was irregularly dilated with some posterior synechiae, and there was a cataractous lens. The tension was normal to touch, and the eye very painful, particularly in the ciliary region. The patient complained of severe frontal headaches.

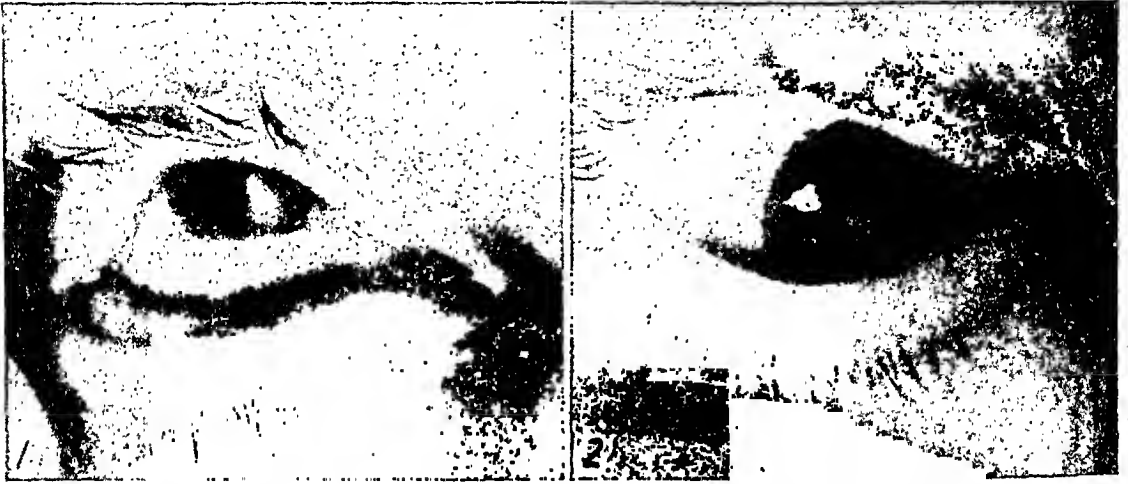
Sulfatherapy was started internally and continued for about three weeks. Besides the local treatments with atropine, local applications of sulfathiazole ointment 5 percent, applications of antiflogistine, ultraviolet irradiations, cauterization, and other measures were used. The only possible foci of infection were eliminated by the removal of several teeth which showed apical abscesses. The smear examination was negative.

On April 22d the condition of the eye was worse; namely, pus in the anterior chamber was filling about one fourth the cavity, the infiltration of the cornea had become very deep, and the general signs and symptoms were gradually becoming more severe.

Typhoid therapy was started, with an initial dose of 15 million triplo-typhoid bacilli intravenously, which caused a fe-

ver of 104°F. At different intervals the typhoid therapy was repeated, with increasing doses, while the local treatment was continued and the sulfatherapy repeated. On May 9th the patient was admitted to the New York Eye and Ear Infirmary. Inasmuch as a fibrinous and cellular exudate was filling almost one half of the anterior chamber, a paracentesis was done with a keratome inci-

either paracentesis or the withdrawing of aqueous, 0.05 c.c. of sodium penicillin, containing 50 Oxford units, was forced into the anterior chamber with a tuberculin syringe. Another 100 units were injected subconjunctivally. Examination of the eye on the following day showed the complete disappearance of the hypopyon; there was a mild chemosis of the bulbar conjunctiva. The patient stated that for



Figs. 1 and 2 (La Rocca). Corneal ulcer, right eye. Fig. 1, case 1, infiltration of the cornea with hypopyon. Fig. 2, case 1, after treatment with penicillin.

sion of the upper part of the limbus, and aqueous was aspirated with a syringe and sent to the laboratory for smear and culture; this was later found to be negative. Several attempts were made to cleanse the anterior chamber of the fibrinous exudate by lavage (repeated irrigations with a saline solution), but very little material was washed out, the mass being strongly adherent to the iris mesh. More irrigations were made with a fresh solution of 5-percent sodium sulfathiazole, and an atropine and sulfa dressing was applied. For the next two days the amount of pus was apparently reduced, but soon the condition returned to the former stage so that as a last resort, I decided to start some sort of penicillin therapy.

On May 15th the patient was returned to the operating room where without

the first time since his illness he had been able to rest at night. The subconjunctival injections were repeated daily at the bedside following instillations of a 4-percent cocaine solution for 10 minutes, the patient's only complaint being a sharp pain upon introduction of the penicillin which lasted only a few minutes.

The number of units injected was gradually increased to 1,000, and on May 26th the cornea for the first time did not stain with fluorescein. The patient had been discharged from the hospital on May 20th and the remaining injections were given in my office. As figure 2 shows, a corneal leukoma and a diffuse haziness of the cornea were still present as a result of the long-standing infection.

Case 2. F. D., a man aged 58 years, was first seen in my office for the present

illness on April 27, 1944. The right eye was affected with absolute glaucoma: T = 3 plus. Vision was O.D. no light perception; O.S. 20/200; with correction 20/30. There was an ulcer of the cornea in the glaucomatous eye, with an infiltration of the central area and a diffuse disepithelization of the cornea; numerous K.P. and a hypopyon were in the lower part of the anterior chamber. The report of the smear of the conjunctiva was "Occasional polymorphonuclear leukocytes, no eosinophiles nor inclusion bodies, nor bacteria. The culture revealed diphtheroid bacilli; the Wassermann test was negative, and there were no apparent foci of infection. The treatment followed was similar to that in case 1; namely, sulfa drugs, typhoid therapy, local treatments, ultraviolet irradiations—with the same negative results.

On May 15th when I was able to obtain 100,000 units of penicillin for case 1, some of the same solution was injected in the lower part of this patient's bulbar conjunctiva, at daily intervals.

He complained of sharp pains soon after the injection, lasting one or two minutes. The doses gradually reached the 1,000 units on May 24th and were continued daily in that amount to June 4th. The hypopyon disappeared very slowly from about May 22d, seven days after the first injection of penicillin, and the corneal ulcer for the first time did not stain on June 6th, 22 days after the beginning of the penicillin therapy.

#### SUMMARY AND COMMENT

Two cases of ulcer of the cornea with hypopyon are reported in which the elimination of focal infections, local treatments, sulfatherapy, fever therapy, and ultraviolet irradiations failed to produce results after almost one month of treatments. Penicillin therapy was begun, with striking success in one case in which the

penicillin was introduced directly into the anterior chamber and the treatment continued with subconjunctival injections; with more modest results in the other case, in which the penicillin was administered by subconjunctival injections alone.

In case 1 the hypopyon disappeared completely in less than 24 hours, and the ulcer healed after 11 days of further therapy. In the second case the hypopyon disappeared after 7 days and the ulcer healed after 22 days.

Although two cases are not enough from which one may draw conclusions of great importance, the results obtained point to the following facts:

1. The direct application of penicillin to the spot of infection is of greater therapeutic value than injections relatively near to it, such as subconjunctival injection.

2. The amount of penicillin required for the almost instantaneous disappearance of the hypopyon by intraocular injections is very small compared with the amount necessary by subconjunctival injections.

3. The use of penicillin by intraocular injection is not injurious to the eye, and the local reaction is negligible, whereas the pain and the conjunctival chemosis resulting from subconjunctival injections, although not serious, are somewhat annoying.

4. The handling of penicillin is not difficult. I made a mother solution of 10,000 Oxford units per c.c. which was kept at a temperature of 5°C. (which is supposed to be active for one month). From the mother solution, fresh solutions containing the amount needed were made for immediate injections.

The recommendation for the use of penicillin by intraocular injections is to be considered as an attempt to reach a better knowledge of the action of this

drug in ocular infections. It is fully realized that revisions of the dosage may be required as experience accumulates on this subject.

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## CONGENITAL CATARACT FOLLOWING RUBELLA IN THE MOTHER

REPORT OF A CASE

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American ophthalmologists are indebted to Dr. Algernon B. Reese<sup>1</sup> for calling to their attention the occurrence of congenital cataract and other congenital anomalies in children born of a mother who had rubella during the first three months of pregnancy. This subject appeared in the Australian ophthalmologic literature in 1942 and 1943, from the pens of N. M. Gregg<sup>2</sup> and a group of colleagues.<sup>3</sup> Dr. Reese reviewed these two papers and added three cases of his own.

The findings in the cases reported included: (1) congenital cataract in 94 patients, of which 20 had the condition unilaterally; (2) microphthalmia; (3) intolerance to atropine; (4) congenital cardiac condition, diagnosed as patent ductus arteriosus in most instances; (5) mental retardation; (6) microcephaly; (7) deaf-mutism; and (8) difficulty in feeding.

Since Dr. Reese presented this matter

before the staff of the Institute of Ophthalmology of Presbyterian Hospital, New York City, I have studied one case and encountered two others which are under the care of colleagues.

*Case report.* D. G., a girl, aged 4½ months, was referred to me on April 18, 1944, because of a white pupil of the right eye, which had been noticed for several weeks. The child had been under the care of Dr. Marguerite A. Schafer, of Hawthorne, New Jersey. The baby was born at term, but has been an extremely difficult feeding problem. At the age of eight weeks, she weighed no more than her birth weight (6¼ lbs.). She suffered from rickets and scurvy, and had a spontaneous hemorrhage into her left knee joint, with subsequent abscess formation. Her parents and her five-year-old sister had "German measles" when her mother was in her second month of pregnancy.

Physical examination revealed no abnormalities except a dense central cataract of the right eye, a congenital cardiac condition (probably patent ductus arteriosus), and malnutrition. The eyes were normal in size, with anterior chambers of the usual depth, and normal intraocular pressure.

The cataract of the right eye was needled on April 21, 1944, at the Institute of Ophthalmology. Absorption of the lens has been slow. Up to date, there has been no evidence of sensitivity to a daily instillation of 0.25-percent atropine sulfate in the right eye.

70 East Sixty-sixth Street.

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## CHEMOTHERAPY IN TREATMENT OF SYMPATHETIC OPHTHALMIA

### CASE REPORT

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It is not the purpose of this paper to speculate upon the etiology of sympathetic ophthalmia. In consideration of treatment of a disease so damaging to vision, however, it is well to recall that at least two, and possibly other factors are thought to be involved in its causation. It is generally conceded that allergy to uveal pigment constitutes one phase as demonstrated in the work of Elschnig,<sup>1</sup> Woods,<sup>2</sup> and by numerous subsequent observers. In addition there also seems to be an infective phase, possibly from an unknown virus or its toxin, or even possibly tuberculous, in that all the manifestations of this disease cannot be explained from an allergic standpoint alone.

Treatment of this syndrome has therefore been empiric in nature, with the exception of the use of uveal pigment injected hypodermically.<sup>3</sup> The normal reaction of the body apparently consists of the development of immunity to the pigment, thus preventing further absorption from the injured area. The rationale of injection of pigment therapeutically is to raise the pigment-antibody content of the blood serum sufficiently to obtain immunologic balance. Susceptibility to sympathetic ophthalmia follows any failure to develop such immunity.

Foreign protein, chiefly typhoid vaccine,<sup>4</sup> tuberculin,<sup>5</sup> diphtheria antitoxin,<sup>5</sup> and boiled milk,<sup>6</sup> have been extensively used, and are most helpful in the management of the disease, although in no instance has it been claimed that eradication of the pathologic process has been

attained. Chemical treatment has for the most part been confined to the use of massive doses of salicylates<sup>7</sup> or arsenicals, chiefly neosalvarsan.<sup>7</sup> Symptomatic improvement has followed in many instances in which these drugs have been employed. Local treatment consists chiefly of the maintenance of full pupillary dilatation in order to prevent formation of synechiae. The attainment of this objective is frequently rendered difficult by the complication of increased tension, for relief of which repeated paracenteses may be done.

Although use of sulfonamides in this disease has generally been held to be futile, Gamble,<sup>8</sup> in 1940, reported a case in which chemotherapy was employed during exacerbations, with very marked improvement. This author felt that the disease could occasionally be controlled enough to maintain useful vision without expectation of actual cure. However, at the death of his patient (from accidental causes), serial sections not only proved the disease to be sympathetic ophthalmia, but also indicated that considerable active pathologic change was present in an eye which appeared quiet clinically.

Thygeson,<sup>9</sup> on the other hand, definitely stated that no improvement was noted in two cases of sympathetic ophthalmia treated by him with sulfathiazole and sulfadiazine.

### CASE REPORT

A case of sympathetic ophthalmia is reported in which fair vision has been retained over the period observed, by the use of sulfonamides during periodic exacerbations, in conjunction with intravenous typhoid therapy and massive doses of salicylates.

C. P. was struck in the left eye, on February 7, 1941, presumably by a piece of rock. Site of wound was in the limbic area at about the 5-o'clock position and

\* From the General Hospital of Weston, A. F. Lawson, Chief of Staff.



apparently penetrating. As the patient had very little pain at the time, no physician was consulted. Spontaneous healing of the wound apparently occurred, and except for moderate injection of the injured eye, the patient was symptom free for about two months. Following this, considerable pain developed in the eye and he noticed rapid loss of vision. As he lived in an isolated community, he did not consult a physician until April 22, 1941, when vision in the injured eye had failed completely and considerable blurring of vision had been noted in the right eye. He was referred to us chiefly for relief of the intense pain in the injured eye.

When first seen, the injured eye was entirely blind; intraocular tension was 76 mm. Hg (Schiötz). A small ciliary staphyloma of purplish hue and about 3 mm. in diameter was protruding at the limbus at the 5-o'clock position. The pupil was markedly constricted and irregular from annular posterior synechiae, and entirely occluded with dense white exudate, precluding ophthalmoscopic examination. The right eye was moderately injected and the pupil constricted, but no synechiae were present. There were numerous keratitic precipitates on Descemet's membrane, and many cells were floating in the anterior chamber, giving a typical aqueous flare. There was moderate ciliary tenderness. Intraocular pressure was 29 mm. Hg (Schiötz). On ophthalmoscopic examination a red reflex could be obtained, but no details of the fundus could be made out. Vision was reduced to light perception.

As the injured eye was exceedingly painful, and as there was no hope of restoration of vision, it was immediately enucleated. Treatment of the sympathizing eye was instituted by the use of intravenous typhoid therapy and massive doses of salicylates. The appearance of

the eye as well as vision improved slightly under this routine, only to return promptly to the original state. It was then decided to try sulfonamides (sulfathiazole orally), a concentration of approximately 5.5 mg. percent being maintained in the blood. Administration of the drug was continued for one week, with dramatic results, including clearing of most of the precipitates from Descemet's membrane and disappearance of the aqueous flare. Vision was 20/30 unaided. There have been nine acute exacerbations of the disease, lasting from one to three weeks during the subsequent two years the patient has been observed. Each attack has been controlled by the use of sulfathiazole, although the response has been more rapid on certain occasions than at others. There has been no elevation of tension and vision has been maintained at approximately 20/30. A few keratitic precipitates remain after each exacerbation and are the only evidence of the presence of the disease. Further hospitalization has been unnecessary.

#### SUMMARY

A case of sympathetic ophthalmia is reported in which chemotherapy was employed in conjunction with other therapeutic methods, after the apparent failure of the latter. Dramatic resolution of the inflammatory process was observed at each exacerbation, following use of the drug, although it was impossible to prevent its recurrence. Vision of 20/30 and an eye which is clinically fairly quiet has been maintained over a period of about two years. Although it is generally thought that chemotherapy is of no avail in any type of uveitis, it is possible that an occasional case of sympathetic ophthalmia may be controlled although not cured through its use.

*169 Main Avenue.*

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TRICHO-EPITHELIOMA  
OF EYELID

## CASE REPORT\*

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A.U.S., AND FRANK B. QUEEN,  
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Tricho-epitheliomata are somewhat rare nonulcerating, nonmetastasizing, often multiple, benign tumors of the skin, of limited growth. Histologically distinctive, clinically they are not distinguishable from many other benign tumors of the skin and dermal derivatives. They present an appearance, in common with tumors of the sweat and sebaceous glands, of small, slightly elevated, flat, pale or translucent, circular or slightly irregular hard tumors, frequently on or near the face.

Very few cases of this uncommon condition have been reported, possibly because the tumor, when uncomplicated, is not of major clinical importance. The authors recently encountered an example of tricho-epithelioma of unusual interest because of its location (on the palpebral margin of an eyelid) and its clinical appearance. A brief summary of this case is presented.

## CASE REPORT

A white corporal, aged 21 years, reported to the eye clinic at Bushnell General Hospital on February 17, 1943. He complained of a small recurrent, painless, localized nodule bordering on the margin of the left upper eyelid. A tuft of material resembling blond hairs protruded from the swelling. The original nodule was first noticed about January, 1942, when a clump of blond hairs was observed among the cilia of the left upper eyelid. These unusual cilia increased in number and length. A small localized elevation of the skin of the eyelid developed concurrent with the abnormal cilia. The patient cut the strand of blond hair when it became noticeably longer than his normal cilia. The growth was never epilated.

Prompt recurrence of the growth occurred after its removal by curretting on or about September 15, 1942. Ulceration was never present. At no time was the growth of the hairy nodule rapid. Development, except for growth of the blond hair, was apparently stationary for two months before the patient reported to this clinic. There was no known etiologic factor. Neither this soldier, nor any member of his family, had a history of nodules on the face, forehead, eyelids, or nose. Complement fixation tests for syph-

\* From the Department of Surgery, E.E.N.T. Section, and the Laboratory Service, Bushnell General Hospital.

ilis were negative. Complete physical examination revealed no other abnormality than the nodule in the left upper eyelid.

Examination of patient's left upper eyelid revealed a tuft of material resembling finely teased dental floss protruding from the lid margin. This material origi-

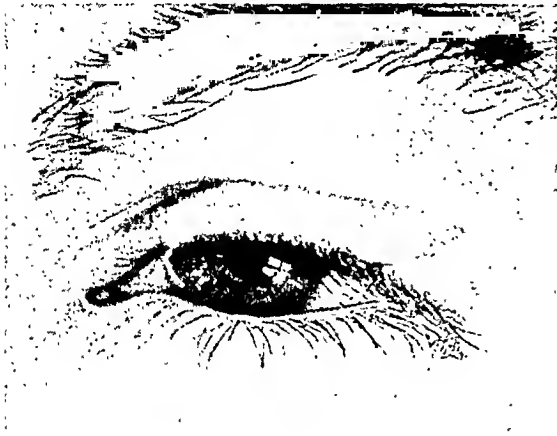


Fig. 1 (Keyes and Queen). A drawing of the tumor.

nated in a small localized firm subcuticular swelling. Viewed through a magnifying loupe, the strand of light-colored material was identified as immature hairs of varying lengths and sizes. The longest hair measured about 10 mm. The terminal one third of the strand of hair curved downward.

The tumor and attached cilia were extirpated by operation on March 17, 1943. The skin of the eyelid was split over the upper limit of the tumor. The skin was undermined and easily freed from the underlying nodule. The tumor was removed without trauma or rupture. Recovery was uneventful. Nine months after operation there was no evidence of recurrence.

#### **PATHOLOGIC REPORT**

*Gross:* The specimen consisted of a small round firm elongated piece of tissue (0.4 by 0.3 by 0.3 mm.) from which

a clump of very light brown hair protruded.

*Microscopic:* There was no evidence of a capsule nor of epithelial covering. The general appearance of the specimen was that of modified corium. The stroma varied in density in different parts of the specimen. One area consisted of firm fibrous tissue with a hyalin keloid appearance and very few cellular elements. Other areas contained many structures supported by a less dense, more normal-appearing connective-tissue stroma.

Each low-power field contained many immature hair follicles, some of which contained a partly developed hair stalk. The internal sheath of the hair contained keratin mingled with the cells of Henle's



Fig. 2 (Keyes and Queen). Histologic detail of a portion of the tumor nodule. Acc. No. 91883 U. S. Army Medical Museum.

and Henkle's layers. Occasionally a glass membrane was present. Many irregularly shaped masses of basal cells were noted. There was an effort at palisading of the basal layer of cells. Some of these cell masses were solid, suggestive of the appearance of Krompecher's carcinoma.

No prickles cells nor other cytologic evidence of malignancy was observed. Other cell masses contained cystic spaces in which keratinous material was concentrically arranged. Hair shafts were definitely present in some of these cystic spaces. The appearance of the hair follicles suggested a hamartomatous reaction, possibly based on lanugo or infantile hair follicles. Sebaceous glands and ducts of sweat glands were also present in the specimen. The blood supply was scant.

Col. J. E. Ash (MC), U.S.A., curator of the Army Medical Museum, reported on this specimen as follows: "I do not believe it is malignant, more of a nevoid lesion, some of the hair follicles being immature, of the lanugo type. I am not too fond of the term tricho-epithelioma, but it would seem to fit this tumor."

*Diagnosis:* Tricho-epithelioma, benign, of eyelid.

#### COMMENT

The term tricho-epithelioma is used in a histologic sense. The trichomatous nature of this solitary lesion was obvious

clinically and histologically. The presence of immature hair differentiated the growth clinically from the tumors of Brooke,<sup>1</sup> Jarisch,<sup>2</sup> and Fordyce.<sup>3</sup> Reference is made to the articles of McDonagh<sup>4</sup> and Traenkle<sup>5</sup> for a discussion of the relationship of epithelioma adenoides cysticum, tricho-epithelioma, and basal-cell cancer.

A search of the available medical literature failed to reveal a report of a similar lesion on the margin of the eye lid.

Definite, clear-cut descriptions of tricho-epitheliomata are difficult to find. Many of the standard texts dealing with tumors do not mention the condition, as Boyd (*Surgical pathology*, ed. 5), Pack and Livingston (*Treatment of cancer and allied diseases*). Ewing (*Neoplastic diseases*, ed. 4), in his discussion of epidermal carcinoma, does not refer to tricho-epithelioma as such, though he does mention (p. 904) that "some basal cell tumors with compact groups of small elongated cells, or occasionally with adenoid characters, arise from the hair follicles."

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#### ENDOPHTHALMITIS SUBSIDING AFTER TREATMENT WITH PENICILLIN\*

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The prognosis in cases of fully developed suppurative endophthalmitis is

\*From Greens' Eye Hospital.

grave, and, as a rule, after all therapeutic measures to save the eye have failed, evisceration must be performed. Recently, however, the introduction of penicillin offers a new therapeutic approach in the treatment of many purulent ocular conditions, as may be illustrated by the following case.

*History.* A man, aged 70 years, was referred to the Greens' Eye Hospital on

March 22, 1944, because of inflammation of the left eye. Four years previously he had been examined by an ophthalmologist and it was found that the patient had an immature cataract in each eye. At that time the vision of the right eye was 20/30 and that of the left eye was 20/120. In April, 1940, an extracapsular cataract extraction was performed on the left eye. On the twelfth postoperative day an iris prolapse in the wound was discovered. It was cauterized several times with trichloroacetic acid, which caused it to shrink to a small bleb from which there was no seepage. Four days later the vision of the left eye with correction was found to be 20/20, and the patient was dismissed by his surgeon as cured. Three months later a cataract extraction was performed on the right eye. The postoperative course was uneventful and subsequent vision of the right eye with correction was 20/30.

On admission to the Hospital, on March 22, 1944, the patient stated that six weeks previously the left eye had become inflamed. A physician had given him some eye drops which failed to relieve the irritation. Two days prior to admission, as the discomfort increased, he again consulted his physician, who diagnosed the condition as keratoconjunctivitis and prescribed sulfathiazole ointment as well as sulfathiazole to be taken by mouth. However, as the vision of the left eye became progressively more blurred, and a slight hypopyon was noted, the patient was referred to the Hospital for diagnosis and further treatment.

*Examination.* On admission, the left eye showed marked circumcorneal injection. The cornea was cloudy, with deep infiltration in the center, and striation of the lamellae. A hypopyon projected 1 mm. into the anterior chamber. There was marked infiltration of the conjunctival flap at the 12-o'clock position. A yellowish reflex from the vitreous was

noted. Vision of the eye was reduced to light perception. Projection was faulty. A smear of the purulent contents of the cul-de-sac showed *Staphylococcus albus* of the nonhemolytic type. The diagnosis of endophthalmitis of the left eye was established.

*Treatment and Course.* The patient was hospitalized on March 22, 1944. On the first day treatment consisted of the local use of atropine ointment and sulfathiazole ointment, intravenous administration of sulfadiazine (70 c.c. of 5-percent sodium sulfadiazine solution in distilled water) and oral administration of sulfamerazine (15 grains). The condition of the eye did not improve, and the intraocular pressure increased to palpation.

On March 23d, the second hospital day, medication with penicillin was begun. The drug was administered in doses of 2 c.c. of a 10-percent solution (20,000 units) in normal saline solution, injected intramuscularly every three hours, day and night, successively, until a total of 22 injections (700,000 units) had been given in three days.

On March 25th the margin of the conjunctival flap was whitish. The cornea was still steamy, and fibrinous exudate was present in the anterior chamber. The iris was grayish and muddy in appearance, and some exudate could be noted on the anterior surface of the vitreous.

On March 26th the upper portion of the cornea appeared more transparent, and the exudative mass had decreased in size. The administration of penicillin was discontinued, and treatment with sulfamerazine, two tablets (15 grains) every eight hours orally, was begun.

On March 27th the anterior chamber was clear, and the corneal transparency had increased. The iris still appeared grayish and muddy.

On the following day the vision of the left eye had improved to perception of

hand movements before the eye. The conjunctival flap was reddish, and its margin did not appear purulent.

On March 29th the exudate had been almost entirely absorbed. The corneal transparency was markedly increased, and the structure of the iris was more distinct. The next day's examination disclosed a further clearing of the structure of the iris. The old cataract wound was free of infiltration. The tension of the eye was decreased.

On April 7th treatment with sulfamerazine was discontinued, and the patient was dismissed from the Hospital. The condition of the left eye was then as follows: Several horizontal ruptures were noted in Descemet's membrane. The aqueous was clear. The pupil was slit-like, with several synechiae. A secondary membrane of the fibrous type was present. The previous cataract wound was perfectly healed. Superficial and deep vessels could be seen in the upper portion of the cornea. The tension was normal to palpation. Vision sufficed to count fingers at 6 inches.

*Summary and Conclusions.* A case of suppurative endophthalmitis is reported in which penicillin was administered successively every three hours over three days, with resultant clearing of the condition. No harmful effect on the patient's general condition was observed during the administration of penicillin.

Sulfa drugs did not inhibit the development of the endophthalmitis, but proved to be a valuable complementary therapeutic agent in addition to the treatment with penicillin.

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## LUXATION OF LENS WITH VOLUNTARY CONTROL\*

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Odd and curious pathologic conditions relieve the monotony of the more common eye diseases. Because of its uniqueness, we present an eye condition unlike any before recorded in the literature, as far as we have been able to discover.

Mr. M. C. B., aged 40 years, presented himself at the Wolfe Clinic on May 2, 1944, with the following history:

In 1919, while a member of the Armed Forces in World War I, stationed at Scofield Barracks, Honolulu, Hawaii, a box of dynamite caps exploded in his face. It was necessary to remove the left eye immediately in the Army Hospital. The right eye was blind and received treatment in the Hospital until January, 1920, when the patient was discharged, for vision was now good in the remaining eye. Previous to entering the Army the patient had been a boxer but had no known trauma to the eyes.

Upon his discharge from the Army the patient worked in a tire repair shop until 1927. While sparring with his brother he noted a sudden haziness of vision, although the eye had not been hit. He went to a physician in Des Moines, Iowa, whose name he does not remember. This physician gave him a lens which "made my vision better than it had been at any time after the dynamite explosion." In 1937 he began to see colored rings around all lights, had some dimness of vision, and noted a sticking sensation in the eye. He consulted another ophthalmologist but was not relieved. Two weeks later, because of this sticking sensation,

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\*From the Wolfe Clinic, Eye Department, Deaconess Hospital.

he sought further medical advice and the physician gave him typhoid shots. The vision returned to near normal, but the sticking sensation became more annoying. The patient felt very definitely that a piece of metal remained in the eye, usually to the temporal side and above, but at



Fig. 1 (Wolfe and Mayer). Lens in anterior chamber

times traveled across the direction of the upper lid to the inner canthus, to return to its usual position after a short time (1 to 2 hours).

Owing to this annoying sensation and the diminution of vision, he visited a state university eye clinic in 1940. He was told the tension of the eye was raised. An X-ray study of the eye was said to be negative. He was given some drops to take home and use, and was told it would help.

Our examination revealed a corneal dystrophy, with marked clouding of the cornea, more in the entire lower two thirds and more especially in the lower temporal quadrant. Vacuoles were found in the central corneal area, and in this region an area 2 mm. in diameter stained irregularly with fluorescein. There was an abundance of new blood vessels in the lower temporal portion of the sclera running into the cornea to within 2 mm. of its center. The anterior chamber appeared deep and the pupil was small (2.5 mm.) and did not enlarge under mydriasis. The

sticking sensation persisted and vision was reduced to the perception of hand motion at 2 feet.

Tuberculin tests were negative. An X-ray study of the eye showed a small foreign body localized in the temporal sclera just above midline while the patient was under our care. One day he called one of us suddenly, exclaiming, "my lens is out." Lying in the lower anterior chamber was a dirty white, sclerosed, lenslike substance approximately 2.5 mm. in diameter. On further questioning the patient stated that this phenomenon had been occurring from time to time since 1927. After some maneuvering he was able to bring this lens remnant (see figure 1) into the anterior chamber and on other occasions he was able to repeat this dislodgment at will. Figure 2 shows the lens absent from the anterior chamber; on examination it was demonstrated to be posterior to the pupil. A high plus lens did not enhance vision at either position, although the



Fig. 2 (Wolfe and Mayer). Lens absent from anterior chamber.

patient showed a +13.00D. sph. which had been given to him in 1927 but which had been of little use since 1939.

The maneuver by which he brought the lens into the anterior chamber consisted of bending directly forward and then slowly turning the head with the right side going down until a shadow made

itself apparent to him. To dislocate into the posterior chamber, the patient would lie down on the bed and raise his chin slowly upward. It was more difficult to bring the lens into the anterior chamber than to dislodge it posteriorly. Through the cloudy cornea no details of the fundus could be made out. The slitlamp beam did not penetrate into the vitreous.

Attempts have been made to get previous history and findings from places the patient had previously visited professionally. Only one answer was received, this from a state university eye clinic. At the bottom of our letter of inquiry the following was written in pencil:

OD—Dislocated lens  
Secondary glaucoma  
Iridocyclitis  
Small foreign body in orbit  
Bullous keratitis

Because of the marked corneal disturbance we are keeping the patient under observation and have not advised surgery.

## REPORT OF AN EYE INJURED BY LIGHTNING

### PATHOLOGIC CHANGES

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(MC), A.U.S.

On August 11, 1943, the patient, aged 18 years, white, was admitted to the Station Hospital at Seymour Johnson Field, North Carolina, in an unconscious state, 15 minutes after he had been struck by lightning. Examination revealed that the patient had sustained second-degree burns to the head, involving the right eye. The subsequent ophthalmologic changes were of extreme interest. Because of the scarcity of similar reports in the ophthalmologic literature, this case was deemed worthy of record.

The patient remained unconscious for

four hours following admission to the Hospital, suffering anorexia and nausea for a period of three days, with some impairment of the sensoria. The subsequent clinical course, including the healing of the second-degree burns and excepting the eye condition, proved uneventful.

*Ophthalmologic findings.* Twenty-four hours after the incidence of the patient's injury, examination of the right eye revealed a marked edema of the upper and lower lids, moderate chemosis of the conjunctiva, and complete external ophthalmoplegia. The pupils were moderately contracted and equal in size. The cornea showed a wedge-shaped, whitish-gray opacity, extending from the 8- to the 10-o'clock position, with the apex in the pupillary region. This area did not stain. Two days later, on slitlamp examination, cloudiness was noted in the posterior half of the cornea. Vision in the right eye was light perception only and there was poor projection to light in the superior and temporal fields. The media were clear at this time.

Examination of the fundus, through a dilated pupil, indicated the loss of retinal transparency due to an edema surrounding the optic nerve which was most pronounced on the nasal side (fig. 1). No hemorrhages nor exudates were seen, and the vessels appeared normal in caliber. The intraocular pressure was normal to palpation and remained so throughout the period of observation.

*Course.* On the fifth day of hospitalization, the lids, conjunctiva, and cornea were clear. No lens nor vitreous changes were noted. The fundus revealed an increase in the retinal edema of the nasal and inferior portions. Projection continued poor in the superior and temporal fields. The functioning of the ocular muscles was normal. Vision in the right eye was perception of fingers at five feet; in the left eye, 20/20-3. The visual fields



of the left eye were normal and remained so throughout the period of observation.

On the fourteenth day of hospitalization, vision of the right eye was 20/200. At this time the patient had become ambulatory.

On the twenty-ninth day of hospitalization, vision in the right eye was 20/200; in the left eye, 20/20. Reëxamination of the fundus of the right eye revealed a

bed with pinhole glasses in place and sandbags to each side of his head. Forty-eight hours later, the detachment was in place and the retinal edema had diminished.

At this time a circular area of redness was noted about the macula. The patient continued abed. The vitreous band decreased in size and shifted slightly toward the inferior temporal quadrant.

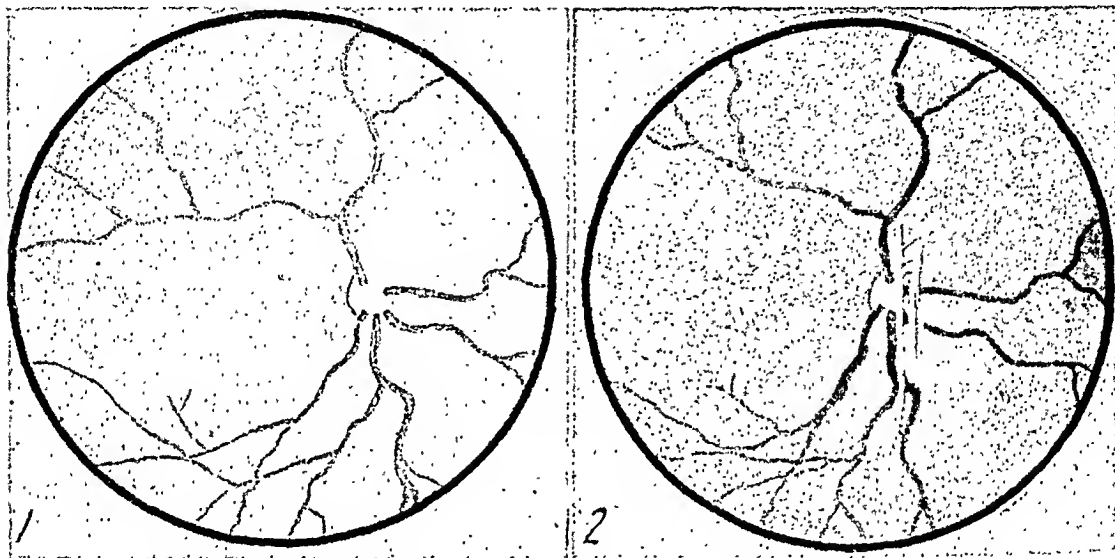


Fig. 1 (Sheppard). The fundus 24 hours after injury, showing edema of the retina involving chiefly the nasal and inferior portions adjacent to the optic nerve.

Fig. 2 (Sheppard). The fundus on the twenty-ninth day of hospitalization, showing a posterior vitreous band with fibrils extending nasally, edema of the retina, a small area of detachment adjacent to the nasal side of the nerve, and two separate areas of choroiditis.

whitish band in the posterior vitreous running vertically for a distance of  $1\frac{1}{2}$  disc diameters above the nerve to a distance of  $2\frac{1}{2}$  disc diameters below the nerve. This band had several small fibrils extending nasally and, apparently, attached to the retina. There was an area of retinal detachment 2 to 3 diopters in elevation adjacent to the nasal side of the nerve. There were two small, irregular, yellowish-white patches of choroiditis in the area of retinal edema at the inferior portion of the fundus (fig. 2). The visual field remained unchanged.

The patient was promptly confined to

On the forty-fifth day of hospitalization, a second detachment was noted in the inferior portion of the retina with 6 to 8 diopters of elevation. The vitreous band had several small fibrils extending to the detachment. There was an increase in the clouding of the posterior vitreous. The nerve head continued to appear normal in color (fig. 3). For the first time, small irregularly shaped opacities were seen in the posterior cortical layers of the lens. Projection was definitely decreased in the superior fields with vision decreased to the perception of fingers at five feet. At this time it was deemed ad-

visible to transfer the patient to a general hospital for further observation and treatment.

The patient was admitted to Moore General Hospital on September 26, 1943. The subsequent course of his progress was reported by the medical staff of that Hospital as follows: His course was uneventful until October 26th, when the right eye became painful and red. The

detachment because of the associated inflammatory processes.

The patient was returned to the Station Hospital at Seymour Johnson Field on December 22, 1943, for rehabilitation. On examination of the right eye at that time, the following observations were made: Vision in the right eye was perception of fingers at two feet; in the left eye, 20/30+2. The right eye had 15 de-

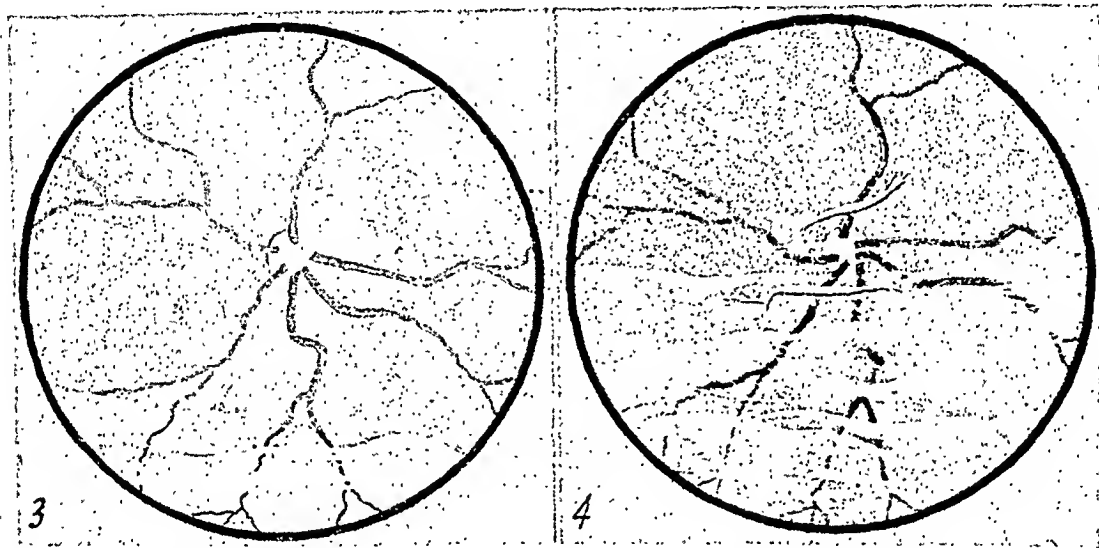


Fig. 3 (Sheppard). The fundus on the forty-fifth day of hospitalization, showing the posterior vitreous band with fibrils extending to the detachment of the inferior retina.

Fig. 4 (Sheppard). The fundus on the 136th day of hospitalization, showing a huge detachment of the retina of the inferior fundus. Several strands of fibrous tissue (retinitis proliferans) are seen.

diagnosis of acute iridocyclitis was made. The aqueous was turbid, with many cells floating in the anterior chamber. The iris was boggy. Several posterior synechiae were noted and K. P. deposits were found on Descemet's membrane. The patient was given the usual local treatments with atropine and hot applications. Artificial-fever-cabinet therapy supplemented the foregoing. After two weeks of treatment, the inflammation gradually cleared.

In the search for foci of infection, a mild prostatitis was found and eliminated. No surgery was advised for the retinal

degrees of divergence. Light projection was absent in the superior quadrants. The patient could distinguish hand movements in the lower temporal quadrant and only strong light in the lower nasal quadrant. The fundus of the right eye could not be clearly discerned due to an increase in the posterior cortical opacities of the lens and the vitreous opacities. However, a complete detachment of the inferior retina was visible (fig. 4).

The patient was discharged to light duty on December 27, 1943, on the 136th day after the injury.

*Comment.* Haab,<sup>1</sup> in 1888, and Oliver,<sup>2</sup> in 1896, each reported a case of retinal changes following flashes of lightning which terminated in blindness. In the *British Journal of Ophthalmology*, 1929, J. N. Roy<sup>3</sup> reviewed two such cases. The first, that of a girl aged 11 years, described a severe bilateral neuroretinitis following exposure to several flashes of lightning. Blindness resulted. The second case was that of a boy, aged 12 years, who was stunned by lightning and later showed ophthalmologic changes resulting in optic atrophy.

Two causative factors should be con-

sidered in evaluating the progressive organic changes observed in the present case. One of these factors may be photochemical action; the other, a thermal action or, more likely, a combination of both. The posterior-vitreous changes with the resultant band formation suggest that there was organization following coagulation of the posterior ocular structures. It is probable that the vitreous band was attached to the retina and its contraction may account for the detachment. Since there were areas of exudation, it is also probable that these may have been a factor in causing detachment.

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### THE SINISCAL-SMITH LID EVERTER\*

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A new type of instrument<sup>†</sup> for everting the upper eyelid is presented herewith. It is hoped that this will fill a long-desired need in the ophthalmologist's armamentarium by affording a quick and simple means by which the upper lid can be everted and the underlying conjunctiva widely exposed to view, displaying the retrotarsal fold and the whole upper cul-de-sac with a minimum of discomfort to the patient. The instrument is an outgrowth of the glove-buttoner which was

used in the Trachoma Clinic in Rolla, Missouri, many years ago and which was later reshaped by one of the co-designers<sup>‡</sup> into a more suitable form for everting the upper lid and examination of the cul-de-sac; from this, it was redesigned by the writer into the present model and presented to the ophthalmic profession for more general use. The instrument will supplant some of the older types of lid instruments used, most of which are primarily lid *retractors* and not suitable for routine use in the office or clinic as lid everters. Because of their bulk, or complex design, many of the older instruments used for lid everting become too unwieldy for everyday use, and, even when carefully manipulated, the lid integument occasionally became traumatized. For these reasons, and also because

\*From the Missouri Trachoma Hospital. (Division of the Missouri State Board of Health).

†Manufactured by Storz Instrument Company, 4919 Forest Park Blvd., Saint Louis, Mo.

‡J. E. Smith, M.D., Huntsville, Alabama.

they were the source of general discomfort to the patient, many of them failed to gain popularity.

The lid everter illustrated here (fig. 1)



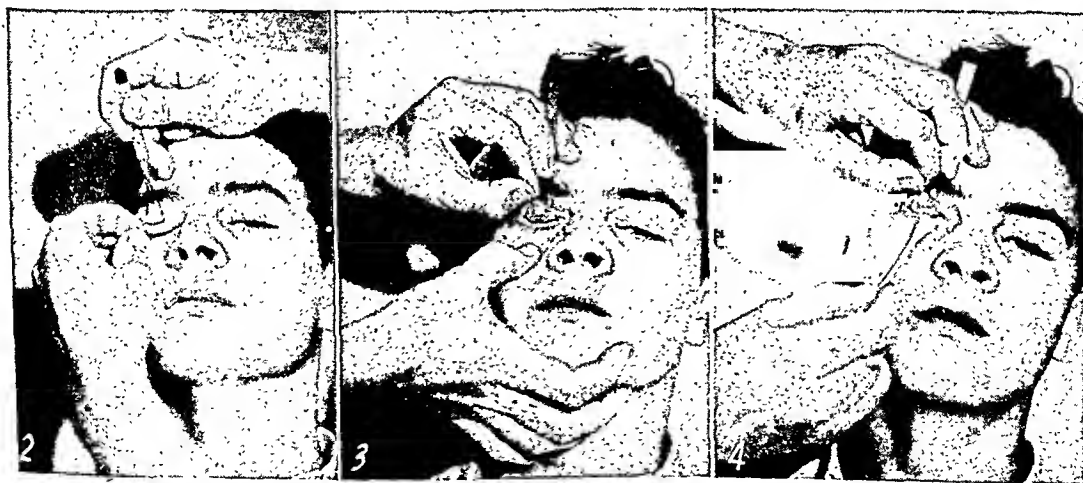
does not injure any of the lid structures, even when marked pressure is applied. By moving the handle from side to side, once the instrument is in position, in order to slide the loop along the skin surface from inner to outer canthal angles, all of the upper extensions of the conjunctival fold can be exposed to view. Its employment facilitates not only the examination of the inner recesses of the conjunctiva—useful, for example, in doubtful diagnosis of the conjunctivitis—but also the search for foreign

Fig. 1 (Siniscal). The Siniscal-Smith lid evertor.

bodies that may have become lodged beyond the tarsal border; it aids in routine examination; in the demonstration of anatomic relationships; and also in the

employment of surface applications of therapeutic agents. When used for this latter maneuver, the instrument can be held entirely in the left hand (*vide infra*), leaving the right hand free for holding applicators or therapeutic solids, as, for instance, in the application of carbon-dioxide snow to the follicles of vernal catarrh.

The instrument, having only one end for use, is simple in action and control. It is held by its handle (corrugated) in the vertical position, with the concave side of the loop facing forward (fig. 2). The *right* hand holds the instrument, with its loop placed against the skin of the lid; well behind the upper tarsal edge, and, while grasping the ciliary margin between the thumb and forefinger of the *left* hand, one directs the patient to look down. By pushing down on the instrument handle while at the same time lifting the lid margin, a wide exposure of the underlying conjunctival surface is obtained (figs. 2 and 3). The extent of surface exposure can be controlled by the amount of pressure and counterpressure exerted on the instrument and lid margin, respectively. Figure 3 illustrates the everted lid held in place by the instrument, which is now



Figs. 2, 3, 4 (Siniscal). Application and use of the evertor.

held entirely by the *left* hand, with the handle fixed between the middle and ring fingers; this leaves the right hand free to apply medications (fig. 4), or for instrumentation, demonstrations, and the like.

Occasionally, a foreign body becomes lodged or embedded in the upper fornix of the conjunctiva, and escapes notice, during the regular search for its presence by mere eversion of the upper lid with an applicator handle, pencil, or some blunt instrument. In the author's experience the following interesting case was observed: A child was brought in to the Clinic for a supposed active stage of trachoma in one eye, showing a moderately swollen upper lid with deeply injected conjunctiva generally and especially in the upper limbus region. Upon careful examination of the upper recesses of the cul-de-sac, there was found to have lodged therein a cockle-bur which had become so deeply embedded as to have eluded discovery during previous routine examinations. A similar experience occurred in the hands of a colleague, who found in his particular instance a small splinter of wood lodged in the upper cul-de-sac and so well encapsulated that it made discovery almost impossible until a wide exposure of the fornix was obtained by marked eversion of the lid.

*Trachoma Hospital.*

## REFRACTION CLINIC\*

DISCUSSION BY ALBERT E. SLOANE, M.D.†  
*Boston*

A housewife, aged 36 years, entered the hospital with many varying asthenopic complaints, which did not include diplopia but indicated that her eyes were never comfortable. Seven years ago she was

operated on for alternating esotropia. One year ago, an alternating exotropia was noted, for which a tenotomy of the external rectus of the left eye was performed, following which she got a good cosmetic result. However, her symptoms persisted. She was working in a factory, operating a weaving machine that required precise fixations at several fixed distances. It was this kind of work that fatigued her most.

## EXAMINATION

Vision was R.E. 20/30; with a +1.50D. sph.  $\approx$  -0.50D. cyl. ax. 180° it was 20/20. Vision L.E. was 20/70; with +1.50D. sph.  $\approx$  -0.50D. cyl. ax. 60° it was 20/40+. The Maddox rod test revealed a hyperphoria of 5<sup>A</sup> for distance and near in the right eye, and in the left eye an exophoria of 4<sup>A</sup> for distance, 12<sup>A</sup> for near.

The afterimage test showed both normal and anomalous retinal correspondence.

The cover test showed an esophoria for near and distance.

Glasses were ordered incorporating a total of 3<sup>A</sup> divided between the two eyes partially to correct the vertical hyperphoria. She reported later that relief was not obtained. Base in prisms were given on two occasions but afforded no relief. Subsequently glasses were prescribed without prisms and again without relief.

## DISCUSSION

I believe that we may eliminate the compound hyperopic correction as being the source of her trouble on the basis that the glasses were correct. It is safe to accept that a patient subjected to at least six tests of her refraction has proper glasses. This brings us to the muscle-balance situation. Some questionable features are encountered at this point: 1). An operation for alternating esotropia

\* From the House Officers' Teaching Clinic, Massachusetts Eye and Ear Infirmary.

† Director of Department of Refraction.

does not generally restore binocular vision since binocular vision is not the picture of a true alternating esotropia. This is further borne out by the fact that an exotropia developed postoperatively since there was no binocularity to fixate the eyes and maintain them in the normal integrated position. Again, if the binocular problem were the basis of her trouble we would expect periods of diplopia, since 5<sup>A</sup> of vertical error cannot easily be fused. All this would tend to argue against a heterophoria as the cause of the trouble. One test serves to uncover the true nature of this patient's binocular status. It was noticed that the eyes were cosmetically straight but that the cover test showed an esotropic condition both for near and distance. In spite of this esotropia noted objectively, the patient consistently showed an exotropic condition with the Maddox rod. Thus the patient had a convergent strabismus by cover test and a divergent strabismus according to the Maddox rod. The explanation for this lies in the fact that this patient has a well-marked anomalous retinal correspondence which was well developed and present for a long time. In this situation it is almost as though there were a false macula in the deviating eye. When the operations were carried out to correct this primary esotropic condition they were, strictly speaking, inadequate to correct it all, since an esotropic condition still existed as demonstrated by the cover test. However, the same operations went too far, inasmuch as they produced an exotropia. This could only be possible where the projection did not correspond to the position of the eyes. This condition is known as paradoxical exotropia. It is not amenable to correction with prisms or exercise and is best treated by ignoring the muscle condition. The aim should be to obtain a beneficial cosmetic result. Eventually suppression will adequately eliminate the symptoms.

## QUESTIONS

Q. Would you expect the symptoms to be relieved by occlusion of one eye and would this not be a good diagnostic test?

A. I would not be surprised if the binocular symptoms did disappear, but I do not believe it is necessarily a diagnostic test.

Q. Why does the patient have discomfort if no single binocular vision is present?

A. Because in most cases of strabismus the suppression area of the deviating eye does not include the peripheral field; the new position of the two eyes may produce discomfort by the new relationship acquired by the peripheral fields.

Q. What is the significance of anomalous retinal correspondence?

A. This indicates that corresponding anatomic retinal areas do not correspond functionally; that an anomalous functional integration has been set up according to the nonparallel position of the two eyes. In this way the person with strabismus has no diplopia and still a full binocular field of vision.

Q. How could you get a Maddox rod reading if no binocular vision were present?

A. Very often the two eyes alternate so rapidly that the person may project as though he saw both images simultaneously.

*243 Charles Street.*

## CORNEAL FORCEPS: NEW TYPE

WALTER MOEHLE, M.D.

*Brooklyn, New York*

The popularity of corneal sections closed by means of suture in the technique of cataract extraction has introduced various designs of forceps for the purpose of adequately grasping the corneal lip. The construction must be such that the

instrument maintains the corneal lip firmly for the placement of the suture without traumatizing the tissue. The majority have the disadvantage of sharp intermeshing teeth where the pressure of the

eliminates these difficulties. Each tip has a single tooth, 1 millimeter long, 1 millimeter wide, and 0.5 millimeter high; they are angulated at 45 degrees, wedge-shaped, and have a semi-sharp edge. Of

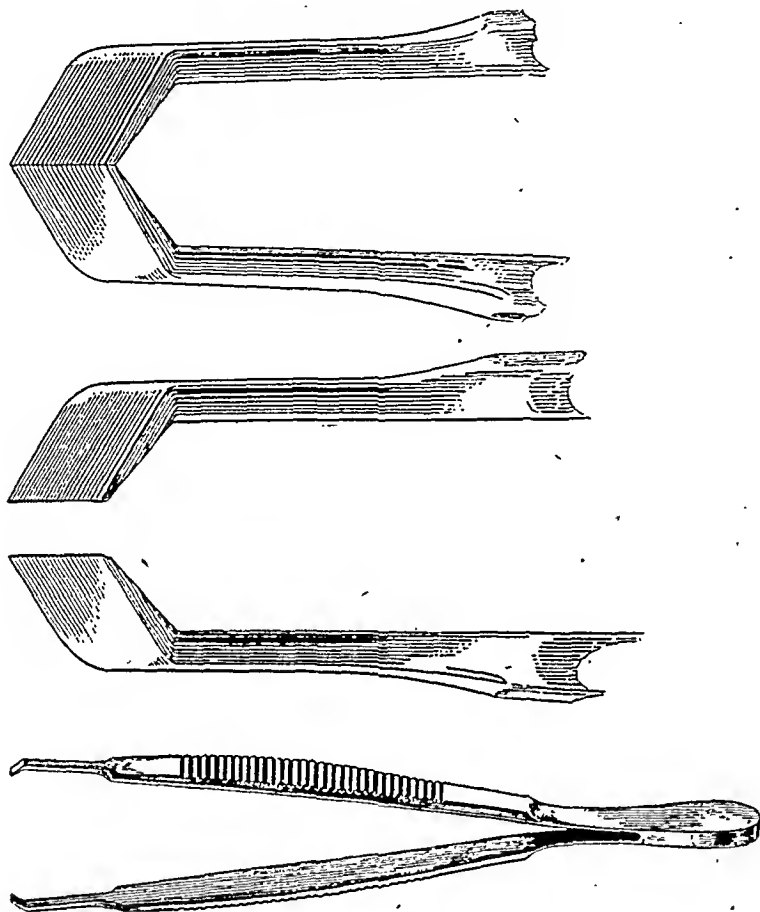


Fig. 1 (Mochle). Corneal forceps: new type.

bite of each tooth of the tip is not directly opposite in its grasp. Teeth which accurately oppose each other obviate this.

I have obtained satisfactory results with a simply designed forceps\* that

most importance is the fact that the edges of the two teeth directly oppose each other, so that, when in use, the pressure on the corneal lip permits a firm vicelike grip but does not tear nor bruise the tissue.

\* Made by Wm. Langbein & Brothers, Brooklyn, New York,

15 Schermerhorn Street.

# SOCIETY PROCEEDINGS

EDITED BY DR. DONALD J. LYLE

## SEMI-ANNUAL MEETING OF THE DEPARTMENT OF OPHTHAL- MOLOGY, THE GEORGE WASH- INGTON UNIVERSITY SCHOOL OF MEDICINE

December 4, 1943

DR. WILLIAM THORNWALL DAVIS,  
*Executive Officer*  
*Washington, D.C.*

The semi-annual meeting of the Department of Ophthalmology of the George Washington University School of Medicine opened with the presentation of cases by the staff of the Department of Ophthalmology. A paper on "Military aspects of ophthalmology" by Col. Frederic H. Thorne (MC), U.S.A., followed, after which Dr. William Thornwall Davis presented a motion picture of the disturbances of the vertical ocular motility. The meeting was concluded with the case discussions.

### MILITARY ASPECTS OF OPHTHALMOLOGY (Abstract)

COL. FREDERIC H. THORNE (MC), U.S.A., stated that except for correction of refractive errors the extent of ophthalmic practice in the Army equals about that which was estimated before the United States entered World War II. Battle casualties are not included. At one station through which 136,000 trainees passed during a 12-month period, 613 ocular operations were performed, 304 were hospitalized for ocular disorders, and 11,996 were refracted and spectacles issued.

Visual requirements for general military service are 20/200 bilateral, correcti-

ble to 20/40 or better. However, before a man can leave for overseas duty his vision must be corrected to 20/40 or better and he must have in his possession two pairs of spectacles. Gas-mask-type spectacles must also be issued when binocular vision is less than 20/70.

The forced-refraction program has been unsatisfactory because of: (1) a lack of available medical officers trained in refraction; (2) the difficulty in keeping spectacles on those required by regulations to wear them; and (3) the inability of the contracting optical firm to furnish the spectacles in sufficient time to prevent clogging of the flow of the personnel through the various training centers. Because of the lack of medical officers, the bulk of the refraction work has fallen on the shoulders of the enlisted optometrists, supervised by a medical officer.

It is believed that the forced issue of spectacles should apply only to those who have a visual acuity of less than 20/100 and to those who are undertaking specialized training of one type or another, and its successful pursuit depends largely upon visual acuity. Permission should also be given to issue spectacles to those who exhibit asthenopic symptoms, provided, in the opinion of the examiner, spectacles are necessary.

Overall supervision of ophthalmology in all branches of the Army by an officer familiar with present-day problems is recommended. This officer should be stationed in the Surgeon General's office and be made responsible, under the Surgeon General, for the assignment of personnel and the coordination of all ophthalmic activities.

Since the bulk of refractions falls upon the shoulders of enlisted optometrists,



these men should be given adequate recognition, and it is recommended that those qualified be given a rating of Warrant Officer, Junior Grade.

*Discussion.* It was asked, with respect to the men who report at the time of induction for examination, and on whom it is customary for the technicians to get the best possible vision no matter how hard they have to "squeeze," what the outcome is when these men get in the Army.

Colonel Thorne replied that it is difficult to answer that question. So many men get in with very poor vision even though their induction examinations showed that they had normal vision. That applies usually to squint cases. As is known, a squint can be alternating or intermittent, but if it is a one-eyed squint, the vision in one eye cannot be corrected, but on the induction papers the findings show that there is normal vision in each eye. He said he thought that "squeezing" vision is fair enough; that is, if there is adequate vision for ordinary purposes. The induction centers encounter the same trouble that examiners have everywhere to get the men to read the chart so that the maximum visual acuity is obtained. They refuse to make any effort and it is practically impossible to obtain it on the mass population who go through the induction centers. There are a great many men to examine and pressure is exerted on them to either pass or reject them. It is impossible, therefore, to examine these men with great care and still hurry them through.

During the time from September, 1942, to about February, 1943, men were sent to the station hospital to which I was attached by their induction boards; the halt, the lame, and the blind. They even sent in a man with a broken back in a plaster cast. In the last few months apparently they are not being so hurried

at induction centers, as the examinations are being more carefully made. When a man is sent in now whose record says he has 20/50 or 20/70 vision, it can usually be accepted as accurate.

It was then stated that the question asked was intended to refer to the myopic. The technician examines them and records the vision obtained by squeezing their lids.

Colonel Thorne said he thought that if they have 20/200 vision with squinting they should have less than 20/200 without squinting or squeezing. This could not be classified as useful vision and he would say that they should not be allowed to stay in the Army.

Colonel Thorne was then asked regarding the number of refractions done under a mydriatic.

He said the great majority are done under a cycloplegic but now when a man is examined who is easily corrected with  $-0.50D.$  sph. or  $-1.00D.$  sph., that completes the examination. But for all practical purposes it can be said that all are done under cycloplegia. Five-percent homatropine is the cycloplegic used. In all probability it is not necessary in all cases.

#### DISTURBANCE OF THE VERTICAL OCULAR MOTILITY

DR. WILLIAM THORNWALL DAVIS presented a motion picture to illustrate this subject. "By far the most frequent and important type of paralysis of a single vertical motor anomaly is trochlear-nerve palsy" (Bielschowsky). Most statistics give too small a number of trochlear pareses because they are not recognized. It occurs at least half as often as abducens pareses, which is the most frequent of all.

The most striking sign is habitual torticollis; that is, a tilting of the head to one shoulder. This occurs only when the

*oblique muscles* are involved, either the superior or the inferior oblique; it does not occur when the superior or inferior recti are paretic. It is the two symptoms, torticollis and upshoot of the eyes with the head tilted to one shoulder, that present the distinguishing differences.

The differential diagnoses (torticollis and the upshoot of one eye with the head tilted to one shoulder) were demonstrated in a motion picture in a case of right superior-oblique paresis. This showed the characteristic posture of the head, or torticollis, and also the upshoot of the right eye with the head tilted to the right shoulder, but no upshoot with the head tilted to the left shoulder. A case of left superior-rectus paresis was also shown, which showed no upshoot of either eye with the head-tilt test.

#### ANOMALY OF THE OPTIC DISC

DR. ERNEST SHEPPARD presented the following cases:

*Case 1.* This patient was a man, aged 42 years. The vision in the left eye was 20/200 with  $-1.00D.$  sph.  $\approx +2.75D.$  cyl. ax.  $90^\circ$ . The history of always having had poor vision of the left eye was confirmed by available records. When first examined in February, 1942, the disc was elevated 4 diopters and so pigmented on the nasal side that the margin was not visible. There was less dense pigmentation extending 1 disc diameter nasally. There was a small striate retinal hemorrhage adjacent to the upper nasal border. The temporal half of the disc showed slight pigmentation. There was a large temporal choroidal crescent and also a patch of choroidal atrophy at the upper temporal edge. The elevation extended almost to the macular area, as described by Klien (Arch. of Ophth., 1936, v. 16, p. 624, case 8). The right eye was normal. The exophthalmometer readings were 23 mm., each eye.

The tension was 22 mm. Hg (Schiötz), each eye. The physical examination was normal. Roentgenograms of the chest, skull, sella turcica, and the optic foramina were normal. He showed a slight reaction to old tuberculin 1:10,000. The blood Wassermann reaction was negative. The tentative diagnoses were: (1) developmental anomaly (as described by Mann in "Developmental abnormalities of the eye," Cambridge Univ. Press, 1937, pp. 127 and 133); (2) choroiditis juxta papillaris of Jensen, of undetermined etiology.

It was asked whether there was any suggestion of a retinal septum or congenital septum, or if there was some tearing of the retina which might be a retinal septum extending a short distance behind the disc. This condition is described by Ida Mann.

Dr. Sheppard replied that there was no septum so far as he could determine. The patient was examined both with the Friedenwald ophthalmoscope and with the Gullstrand binocular ophthalmoscope and there was no septum nor were there any prepapillary membranes such as are seen in proliferative retinitis.

*Case 2.* This patient was a five-year-old boy on whom a history of left convergent strabismus since birth was obtained. The visual acuity was 2/200, left eye, with  $+5.50D.$  sph.  $\approx +1.00D.$  cyl. ax.  $90^\circ$ . The disc was elevated 4 diopters and obscured by gray tissue. There was a large scleral ring surrounding the disc. There had been no evidence of inflammation and no change in the appearance in 18 months. With occlusion the visual acuity improved to 20/70+2. The visual fields, as nearly as could be determined, were normal. A tentative diagnosis of developmental anomaly was made.

The possibility of malignancy in each case was considered.

## PEMPHIGUS OF THE CONJUNCTIVA

DR. E. LEONARD GOODMAN presented Mrs. E. B. P., a white woman, aged 59 years, who was first seen in September, 1936, at which time she complained of having had a "cold" in each eye for the previous two months. No previous history of ocular pathology was given. The patient suffered some discomfort but no actual ocular pain. There was no increase in tears, but some increase in mucous formation.

Examination showed the palpebral conjunctiva of both lower lids to be thickened and boggy red with a thick gelatinous, pseudo-membrane in some areas. No bullae were present. A diagnosis of chronic muco-purulent conjunctivitis was made and zinc and argyrol solutions were ordered.

The patient returned three months later with an aggravation of her symptoms and beginning evidences of scar tissue formation in the conjunctiva of the lids and retrotarsal folds. A working diagnosis of pemphigus of the conjunctiva was made. There were no lesions of the skin or other mucous membranes present.

Laboratory findings were as follows:

(1) conjunctival smear—few pus cells, few epithelial cells, and staphylococci; (2) urinalysis—negative; (3) Wassermann—negative; and (4) tuberculin reaction (intradermal)—negative. The patient's diet was lacking in green vegetables and milk.

Medication prescribed was: (1) series of ultraviolet (cold quartz) irradiations; (2) Fowler's solution internally; (3) cod-liver-oil concentrate; (4) calcium lactate; (5) liquid petrolatum and 1:8,000 mercuraphen locally; and (6) correction of diet.

The acute inflammatory symptoms soon abated but symblepharon formation in both lower cul-de-sacs, most marked

in the nasal corners, became rapidly more marked in the succeeding three months.

The patient was seen again after a period of six years. She stated that the redness of her eyes had disappeared during this period except occasionally, until one month ago when the right eye again became persistently inflamed. The lower cul-de-sac on the right side was now obliterated nasally and on the left showed heavy cicatricial bands. The cornea in each eye was, so far, unaffected. The patient did not complain of tearing.

It was asked whether any surgery to relieve the adhesions would be indicated now that the case was in a quiet stage.

Dr. Goodman said that this patient came to him as a last resort about three years ago with that same question and he did not recommend surgery. He did not think she had enough symptoms to warrant surgery and if very careful surgery were attempted, the benefits obtained would not justify it. Unless her symptoms become worse, or the cornea becomes involved, he said he would not advise surgery.

## RETINAL DETACHMENT IN CHILDHOOD

DR. FRANK D. COSTENBADER demonstrated two cases of retinal detachment occurring in children under the age of 15 years. It was noted that the incidence of retinal detachment during the first two decades of life is less than 0.02 percent according to Stallard, Lindner, and Arruga.

*Case 1.* A white boy, aged nine years, showed upon examination a large bilateral bullous detachment of the entire inferior retina of the left eye, presumably following a blunt blow eight months previously. No hole was demonstrated. Two operations resulted in an incomplete reattachment, remaining detachment being limited to the peripheral inferior retina. The visual fields, greatly reduced

before operation, showed only a restriction of 10 degrees in the superior peripheral field after surgery. Almost complete activity had gradually been resumed without additional detachment. Central vision was 20/70 corrected. Possible causes of incomplete cure considered were: (1) retinal bands and (2) choroidal tumor, although transillumination of the sclera had been constantly good.

*Case 2.* A white girl, aged 12 years, had an extensive detachment of the entire inferior retina in the right eye without demonstrable cause other than myopia. Two operations resulted in a complete reattachment with almost complete restoration of the peripheral visual field, and the final corrected vision was 20/50+. The left eye showed a detachment of the inferior temporal and a portion of the inferior nasal retina 16 months after the retina of the right eye became detached. The left eye was not operated upon, but physical activity was restricted and atropine instilled. The retina restored itself over a period of 16 months, even though physical activity was resumed. Final examination of the left eye revealed corrected vision of 20/30, peripheral visual fields restricted 5 to 10 degrees superiorly, and no evidence of residual detachment. It is interesting to note that both eyes were myopic. No tears or disinsertions were ever demonstrated. No evidence of intraocular inflammation was present except fine strands in the vitreous. All tests for acute or chronic systemic infections were completely negative.

It was asked, with regard to the second case, what the indications were for surgery on the one eye and the contraindications for surgery on the other eye with the same condition.

Dr. Costenbader said that the reason for not operating on the second eye was the objections of the parents. They did

not wish to have the other eye operated upon. With no treatment except reduced activity reattachment took place.

#### BILATERAL AMBLYOPIA DUE TO INCOMPLETE OPTIC ATROPHY FOLLOWING CRUSHED CHEST

DR. RONALD A. COX presented the case of a Marine who gave a history of having sustained injury when a jeep accidentally overturned, crushing his chest and causing massive internal hemorrhages. The patient was unconscious for three days and upon awakening was bilaterally blind. The peripheral areas cleared gradually in both eyes but large central scotomata remained, and the patient was centrally blind (20 months after injury).

*Conclusions.* From careful study of the case and the literature, the conclusions are: (1) That massive loss of blood from the body may cause serious loss of sight; although the patient may recover, with complete recovery from the anemia, the blindness is permanent. (2) That the evidence afforded by the ophthalmoscope points to thrombosis of the central retinal artery as the usual cause of the blindness that occurs in posthemorrhagic anemia. (3) That the blindness is due to degeneration of the retinal ganglion cells, together with their long processes which make up the centripetal fibers of the optic nerve, and that the diminution in size of the vessels is a result of and not the cause of the blindness.

#### FOREIGN BODY IN CATARACTOUS LENS LOCATED BY VOGT X-RAY TECHNIQUE

DR. RICHARD W. WILKINSON said that Mr. J. D., an automobile mechanic, aged 34 years, on July 8, 1942, was tapping a piece of steel with a hammer and something flew into the right eye. He was seen on July 9th at which time the injury appeared as a small superficial

abrasion near the center of the cornea. No foreign body was found at the time of injury. Within three days there was complete healing and the patient was discharged.

Three weeks after the injury he was inducted into the Army, passing all visual tests. In December, 1942, five months following the injury he noticed that the vision in the right eye was blurred and upon reporting to the Army doctors a diagnosis of traumatic cataract was made. He was studied at Fort Wayne and later at Atlantic City where several sets of X rays were taken in the usual way. However, no foreign body was found. There was no "pull" felt when the magnet was applied.

The patient was seen again in April, 1943, at which time there was a fully developed cataract in the right eye. Light projection was good. The pupils were equal, and reaction to light normal. Examination of the cornea showed a thinly veiled scar above the center which appeared, with the slitlamp, to be a penetrating wound. There was no evidence of injury to the iris. No definite tear could be made out in the lens capsule. The left eye was normal, vision 20/15.

The patient was referred to a local roentgenologist and again the report was "examination of the right orbit fails to demonstrate evidence of an opaque foreign body."

As this was a compensation case and in view of the length of time that had elapsed since the injury and the diagnosis of traumatic cataract made, the patient was referred to Dr. Jonas Friedewald, who, in turn, referred him to Dr. Maurice Feldman for X rays. Using the Vogt technique, Dr. Feldman found a minute opaque foreign body located apparently near the posterior surface of the lens.

In the summer of 1943, the patient

was discharged from the Army, and in September an extracapsular cataract extraction was performed, and the piece of metal was recovered from the lens substance. The patient made an uneventful recovery and the corrected vision was 20/20.

This case demonstrates the value of the Vogt technique where other methods of localizing the foreign body fail. A "bone-free" film, usually a dental film, is placed nasally to the eyeball and pressed deeply into the orbit, and soft roentgen rays are directed from the temporal side. The anterior segment is nicely presented without interference by the orbital bones. The X ray will show particles of metal, glass, cement, or stone in the anterior segment of the eye which are frequently not seen by other methods.

X-ray films were demonstrated showing a foreign body.

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## NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

December 21, 1943

DR. PAUL A. CHANDLER, *presiding*

### PENICILLIN IN OPHTHALMOLOGY

DR. LUDWIG VON SALLMANN presented a paper on this subject. He said that studies on the toxicity of penicillin for the eye revealed that solutions or ointments containing 0.25-percent sodium penicillin (about 300 Oxford units per cubic centimeter) were well tolerated by rabbit and human eyes in various types of application. Solutions of higher concentrations damaged the epithelium of the rabbit cornea. Frequent and continued instillations, the application of salves, corneal bath, and iontophoresis were studied. The concentration of penicillin in the aqueous after local and systemic treatment was highest by far with the ioniza-

tion method, moderate with corneal bath, and small with intramuscular injection. Penicillin was usually not detected in the aqueous after frequent and prolonged use of salves and instillations. The addition of two wetting agents, aerosol 1B and penetrasol B, did not change these results. Nor did the wetting agents increase the permeability of the cornea beyond that obtained with local anesthesia.

The effect of local penicillin on intraocular infections with three types of pneumococcus (types III, VII, and X), two strains of mannitol-positive *Staphylococcus aureus*, and two strains of *Cl. welchii* was studied and compared with the result of iontophoretic introduction of sodium sulfadiazine combined with the systemic use of the sulfonamide compound. In most series of experiments the lens was injured during the inoculation of the dilution of the culture into the anterior chamber. Penicillin therapy was greatly superior to the combined sulfadiazine treatment in checking acute infections with pneumococci and staphylococci. Penicillin was also effective in the treatment of pneumococcic infections when the interval between the inoculation and treatment was extended to 12 and 13 hours. Dilutions of *Cl. welchii* cultures were injected directly into the lens. This infection was not influenced by any treatment when it began six hours after inoculation.

Dr. Von Sallmann further stated that a limited number of clinical observations at the Institute of Ophthalmology and experimental data obtained on acute intraocular infections with penicillin-sensitive organisms indicate that treatment should be started as early as possible and before the suppuration of the anterior segment of the eye has reached a peak.

Dr. Von Sallmann was asked whether or not penicillin could be used in the treatment of vitreous conditions, to which

he replied that no penicillin was found in the vitreous after local and systemic introduction of penicillin.

Mahlon T. Easton,  
*Reporter.*

## NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

January 18, 1944

DR. PAUL A. CHANDLER, *presiding*

### SURGICAL TREATMENT OF TUMORS OF THE LID MARGINS

DR. ALGERNON B. REESE read a paper on this subject and presented slides to demonstrate his technique.

Dr. Reese said that surgery is preferable to irradiation in the treatment of most cases of epithelioma of the lid margins. He described two techniques in which he found satisfaction. One is indicated when approximately one third or less of the length of the lid must be resected and the other when more than approximately one third of the length of the lid must be resected. The principle of both procedures is a sliding graft from the temple. Some advanced cases of epithelioma of the lid should be treated by irradiation and surgery. These operations were also useful in the treatment of nevus of the lid margin and for the repair of postirradiation defects of the lid margin, congenital coloboma, and traumatic coloboma.

Dr. Reese said that for the treatment of a papilloma, excision with cauterization of the base is adequate because the lesion does not spread beneath the skin surface. Hemangioma is a nonprogressive type of lesion, and usually repeated injections of 5-percent sodium morrhuate is sufficient. For precancerous melanosis irradiation is indicated and for cancerous melanosis usually exenteration.

Question: If you have done an operation and you feel irradiation should be used, how soon after operation would it be advisable to use the X ray to a fair extent?

Answer: Dr. Reese said he knew of no case in which he had used irradiation after operation. He saw no reason why it should be carried out immediately.

Question: What should be done with very small epitheliomas such as one sees in private practice?

Answer: Dr. Reese said he thought that if the lesion is an epithelioma it would require resection of one third the length of the lid, and the simpler procedure is indicated.

Question: Most hemangiomas we see are in young infants. Is any treatment necessary for these? If you do undertake

treatment do you do it right away or do you wait a certain length of time, and, if so, how long?

Answer: There is a general rule for hemangiomas and that is the earlier they are treated the more sensitive and responsive they are to treatment. Radiation or sclerosing solution is used. Therefore, Dr. Reese said he thought the sooner you get after them the better.

Dr. Reese concluded by stating that the point he wanted to emphasize is the fact that these cases should be handled by ophthalmologists and that surgery gives the best result; that he saw no reason why ophthalmologists cannot treat them more satisfactorily than any other group.

Mahlon T. Easton,  
*Recorder.*

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## ACCEPTABLE PRACTICES FOR DISPENSING GLASSES

One of the most controversial problems that has confronted ophthalmologists throughout the years and seems today no nearer solution than it did 50 years ago is how to have the prescription for glasses for their patients filled in a satisfactory and ethical manner. Even the most acceptable practice—namely, that of referring the patient to a dispensing and nonrebating optician—has drawbacks and when one realizes that such opticians are available to only a few ophthalmologists, the impossibility of considering referral to such as the only sound practice becomes patently absurd. Can one say that because there may happen to be a

dispensing optician available he must be employed by the ophthalmologist? Suppose he is distasteful to him in other ways, even if ethical!

The writer has searched in vain for specific statements of policies enacted by the House of Delegates of the American Medical Association in regard to these matters. The ruling cited below applies to rebating only. It is enlarged upon in a "Report of the Reference Committee on Amendments to Constitution and By-Laws" in 1942, p. 70, adopted by the House of Delegates, but this also fails to refer specifically to the problem that concerns the ophthalmologist.

In Chapter III, Article 1, Section 5, of the Principles of Medical Ethics of the



American Medical Association it is stated "It is unprofessional to accept rebates on prescriptions or appliances or perquisites from attendants who aid in the care of patients."

Resolutions adopted by the Section on Ophthalmology of the American Medical Association at the Chicago Session, in June 1924, but never presented to the House of Delegates and consequently never adopted by the House, were as follows:

RESOLVED, That it is the sense of the Section on Ophthalmology of the American Medical Association that we deprecate the selling of glasses by the ophthalmologist to his patients in communities where the services of reliable dispensing opticians are obtainable; and

RESOLVED, That the acceptance of commissions or considerations, either directly or indirectly, from opticians and optical houses from the sale of glasses is absolutely contrary to all our standards of medical ethics and is just as reprehensible as the splitting of fees.

It would seem that far fewer ophthalmologists merely give the patient the prescription for glasses and permit him to enter alone into negotiations with an optician, and themselves have nothing to do with the finances of the procurement of the glasses, than those who share in the financial transactions inherent in dispensing the glasses in some manner or other. If this supposition is correct, it means that most of the eye physicians so acting desire, or are forced, to participate in the financial transaction. The secrecy which they maintain in regard to the matter indicates at least a lack of approval of the practice.

It is understandable that in the numerous communities where there are no dispensing opticians the ophthalmologist must find some other agency to fill his

prescription. Criticism has seldom been directed toward ophthalmologists who have dispensed their own optical goods and charged the patient for the glasses plus the physician's overhead if no dispensing optician was available. However, there are many who do not wish to enter into this mechanical and commercial phase of ophthalmology and seek for some other solution.

There are others who hesitate to ask the dispensing optician to make the numerous changes in lenses sometimes necessary before the patient is comfortable, without extra charge to the patient, yet themselves have no reserve account against which to charge the loss and would welcome some means of avoiding this situation. If it is granted, as is surely true, that most dispensing opticians do actually finance any changes that the referring ophthalmologist directs if made within a short period, is this not essentially a tacit business arrangement with the optician which he accepts in order to encourage patronage?

The question that the profession must decide is whether it is ethical for the ophthalmologist to enter into a purely business relationship with the patient in addition to his professional relationship. In its simplest terms this involves the furnishing of glasses at a price to the patient which will at least cover costs, breakage, mistakes, bad accounts, and so forth. It must undoubtedly be granted that this business will usually be conducted for a profit and may not be reflected to the patient in reduced cost to him, though undoubtedly it often will be. If it happens that the ophthalmologist does not have the time, the desire, or the mechanical bent to fit frames, mount lenses, and perform the many other duties of an optician, may he ethically employ a technician to do this and he himself conduct the financial transactions with the wholesale optician and the

patient as regards the glasses?

It has also been proposed that the eye physician may employ an agent to dispense the lenses at a price specified by the doctor and to collect the fees and turn over to the ophthalmologist any profit accruing from the transaction after deducting the agent's commission, overhead, costs, and so forth, or to charge any loss to the physician's account. The catch is that if the ophthalmologist specifies a price that seems too low to the agency his business will be refused. By too low is meant a price that is materially below the usual retail price in the community or any charge very close to the wholesale price, because such a charge would tend to reduce the general retail price. Manufacturers of optical goods are primarily concerned with the wholesale price in the setting of which they have the important voice and they will concern themselves very little about anything that will not affect this. But if anyone attempts to reduce this, let him beware!

Do these practices constitute rebating? Certainly the first two could not be so classed. They may, however, be associated with hidden profits for the physician, though this is not necessarily true.

There should not be a law, nor even a rule of ethics, in a democratic country that has not the approval of a majority and it is dangerous to have one that is violated by the majority. Can it be doubted that the present ruling as now generally interpreted is in that class?

It has proved demoralizing to the profession to have in effect a ruling that is so unpopular that it is not enforced and is essentially unenforceable. A definition of what exactly constitutes the rebating referred to in the Principles of Medical Ethics is needed. Some means of dispensing lenses that are available or can be made available to every ophthalmologist should be officially sanctioned by the medical profession. Nothing but in-

creasing dissensions can come from the present uncertainty. Therefore, it behooves the leaders in ophthalmology to formulate regulations that will cover these cases.

Would it not be a sound idea for the Executive Committee of the Section on Ophthalmology of the American Medical Association to formulate a resolution defining exactly what practices in regard to dispensing of optical goods may be ethically entered into by the members of the Section? If the resolution is adopted by the section, it should then be presented to the House of Delegates for adoption and thereby become the current ruling for ophthalmologists in organized medicine. An interpretation sufficiently broad to cover the various needs in different communities and under diverse circumstances might well settle this continually distressing question.

The writer has no desire to see a coat of whitewash applied to black practices. But he does believe that to declare certain procedures unethical and let it go at that is not sufficient, but that the positive phase of the question should be considered and a definition of what is permitted be given.

The writer is not ingenuous enough to believe that anyone who has heretofore had a profit from the sale of glasses that has constituted an important part of his income is going to give it up for any ethical consideration whatever. But a definition of ethical practices might be useful to newcomers into the profession who desire to follow the precepts they have learned in their training. It would be very helpful in ultimately rooting out bad practices if every national society, and local too, would adopt these principles as requirements for membership and make a special point of the matter in regard to candidates for enrollment. The American Board of Ophthalmology for many years had all candidates sign

an agreement not to accept any form of rebate, but this was discontinued because it was not possible to follow up the matter. Now there is a statement on the attitude of the Board in the matter which the candidate must read. Continued stressing of ethics by the Board, even if they think a pledge undesirable, cannot fail to influence well-educated young ophthalmologists who are entering practice with high ideals and great respect for the opinion of the Board members. It is not thought that passing new directives would bring about Utopia. Nor is this a police measure. It would, however, substitute a guide for a prohibition.

Lawrence T. Post.

### MEDICAL SPAIN IN MEXICO

The praise and reverence accorded to great men, although not commonly so analyzed, has in large part a utilitarian purpose and effect. Such may have been the original design of the founders of that ancestor worship which is so all-pervading a feature of Chinese life, although it must be admitted that an important role may have been played by primitive man's tendency to assume continuity of existence for that mysterious psychic unit which we call the soul.

Regard for the merits and achievements of human forebears has undoubtedly contributed much to the development of morality and ethics. Such influences are seen in family tradition and in the ideals and tendencies of politics and science. When we assemble, either in person or in the creation of literary monuments, to honor one who during life accomplished great things for our chosen profession, we gain by the stimulus to activity along similar lines.

The greatest scientific workers are conspicuous not merely for their individual labors but also as leaders, as centers of schools of thought, method, and

investigation. Examples of such radiating influence are Newton the physicist, Harvey the physiologist, Koch and Pasteur the bacteriologists, and Galileo the astronomer.

A man who, during his long and very active life, and also after his death, was to be counted among the greatest not only in research but in leadership was born in 1852 in an obscure village of Spain. That country, often thought of chiefly in connection with tragic facts in her history, has produced many men distinguished in the arts of peace. Ramon y Cajal lived to receive the greatest honors bestowed upon scientists, including the Nobel prize. In life, and after death, he was revered by an earnest group of scientific workers of his own and other countries.

The ghastly civil war in which Spain pointed the way to the present worldwide conflagration had, among other disastrous consequences, the effect of driving into exile a number of those Spanish intellectuals who had espoused the democratic cause. Men formerly conspicuous in Spanish medical education are now to be found in several of the former colonies of Spain in the Western Hemisphere. One of these, Professor M. Márquez, long known among ophthalmologists as the founder of the Archivos de Oftalmologia Hispano-Americanos, is now practicing in Mexico City. A pupil and profound admirer of Ramon y Cajal, our distinguished colleague illustrates the fact that civil warfare has frequently benefited humanity by forcing into exile workers and thinkers who enriched the land of their adoption.

In Mexico City, a couple of years or so ago, Professor Márquez joined with other Spanish physicians "who now enjoy the hospitality of the Mexican people" in founding "El Ateneo Ramon y Cajal," a medical organization to which, says Márquez, the name was given with

"the idea . . . of placing our association under the egis of the greatest man of our race who has existed in the realm of biology . . ." On October 17, 1942, the new Ateneo joined with a distinguished and much older Mexican medical organization, the "Academia Nacional de Ciencias Antonio Alzate," in celebrating the eighth anniversary of the death of the famous neuro-anatomist. The Ateneo also created a new medical journal, "Anales de Medicina del Ateneo Ramon y Cajal," an impressive publication, of which four issues have so far appeared. The energetic editor of this publication, as might be supposed, is Professor Márquez.

The first issue of the Anales was devoted to the addresses delivered at the anniversary celebration just referred to, including a paper by Márquez on "Cajal, investigator and teacher," one by Julio Bejarano on "Cajal, the citizen," one by Martinez Baez on "Cajal, the biologist," and one by Tomás G. Perrin entitled "The voice of Cajal." (The Madrid "Center for Historic Studies" some years ago undertook the phonographic recording of the voices of distinguished persons, and a recording of Cajal's voice was reproduced at the meeting in Mexico City.)

Cajal, we are reminded by Márquez, "discovered a microscopic new world: that of the fine structure of the nervous system, fundamental basis for the knowledge of its normal and pathologic functioning." Of the central nervous system, Cruveilhier (quoted by Márquez) had said in 1871: "Of all the organs there is none whose study more excites our curiosity and unfortunately there is none whose texture is surrounded by denser shadows." It was left for Golgi and especially for Cajal to lift the veil.

A famous Italian psychiatrist wrote of Cajal "Without exaggeration . . . it may be said that modern neurology owes

above all to Santiago Ramon y Cajal the enormous progress made in the past century." A German physician, writing on the occasion of Cajal's death in 1934, said: "To Ramon y Cajal has been granted a fate which only very exceptionally falls to the lot of a man of science: he wished to make the name of his country respected throughout the whole world. This aim he attained."

Because the optic nerve and retina, with the optic tracts and centers, are a part of the central nervous system, the work of Ramon y Cajal belongs as much to ophthalmology as to general neurology. The new Mexican medical publication established by Márquez and his colleagues is a fine monument to Spain's greatest medical scientist.

W. H. Crisp.

## CORRESPONDENCE

### RELATION OF ANISOMETROPIA TO ANISEIKONIA

Editor,  
American Journal of Ophthalmology:

In the May, 1943 issue of the American Journal of Ophthalmology we published an article entitled "A study of the aniseikonia in a case of increasing unilateral index myopia."

In this article we reported the measurements obtained between the years 1936 and 1942 in a case of anisometropia due to increasing lenticular myopia in the right eye. A close association between the anisometropia and the measured and computed aniseikonia was shown. We have had, since then, a chance to recheck this patient—in March, 1943, and in November, 1944. We thought that it might be of interest to you and your readers to have a short report on these follow-up examinations. Both in 1943 and in 1944 the patient returned complaining of recurrence of his symptoms of reading difficulties and of decreasing

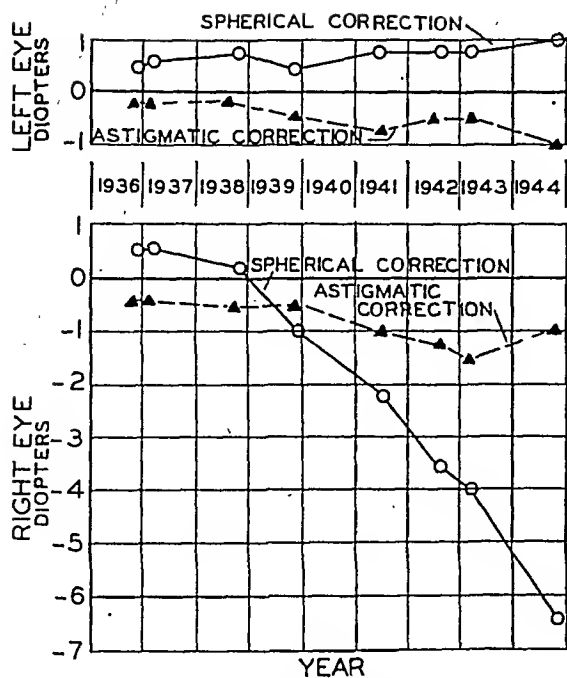


Fig. 1 (Burian and Ogle). Graph of the changes in the spherical and astigmatic refractive errors of a patient with increasing unilateral index myopia over a period of eight years.

vision in the right eye. Objectively an increased density of the right lenticular nucleus was found, without a marked increase in cortical opacities.

The spherical refractive error in the

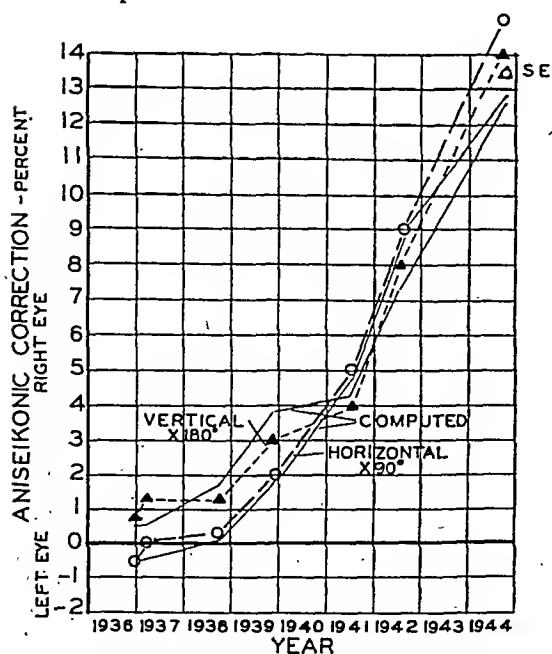


Fig. 2 (Burian and Ogle). Graph of the aniseikonia of the same patient, showing the marked increase that accompanied the progress of the anisometropia. The solid lines are the calculated figures.

right eye had increased to  $-4.00D$ . in March, 1943, and to  $-6.50D$ . in November, 1944. The corrected visual acuity of the right eye on these dates was 20/40+3 and 20/60, respectively. The refraction of the left eye had remained essentially unchanged. The aniseikonia, when the patient was last measured, had increased to 13.5% over-all in accordance with the increase in anisometropia.

The enclosed two graphs represent the changes in refraction over the entire period from 1936 to 1944, and the corresponding changes in aniseikonia for the same period of time.

(Signed)

Hermann M. Burian, M.D.  
Kenneth N. Ogle, Ph.D.

#### CAPILLARY HEMANGIOMA OF THE PALPEBRAL CONJUNCTIVA

December 26, 1945

Editor,

American Journal of Ophthalmology:

In the November, 1944, issue of this Journal there appeared a pathologic report entitled "Capillary hemangioma of palpebral conjunctiva" by Capt. Otis D. Wolfe.

Several points in this case do not support such a diagnosis. Although the described tumor was covered with epithelium, microscopic examination revealed thin-walled capillaries, young fibrous tissue, and inflammatory cell—all typical of an inflammatory granuloma. The patient was noted to have had five chalazia previously. One of the most common causes of a polypoid mass of granulation tissue upon the palpebral conjunctiva is the rupture of a chalazion through the conjunctiva. The tumor described by Captain Wolfe suggests a similar origin. Reference—Duke-Elder, W. S. Textbook of ophthalmology. St. Louis, C. V. Mosby Co., v. 2, p. 1787.

(Signed)

Frank C. Lutman, 1st Lieut.  
O-535577 M.C.

# ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

## CLASSIFICATION

- |  |  |
|--|--|
| 1. General methods of diagnosis                        | 10. Retina and vitreous                                |
| 2. Therapeutics and operations                         | 11. Optic nerve and toxic amblyopias                   |
| 3. Physiologic optics, refraction, and color vision    | 12. Visual tracts and centers                          |
| 4. Ocular movements                                    | 13. Eyeball and orbit                                  |
| 5. Conjunctiva   | 14. Eyelids and lacrimal apparatus                     |
| 6. Cornea and sclera                                   | 15. Tumors   |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries   |
| 8. Glaucoma and ocular tension                         | 17. Systemic diseases and parasites                    |
| 9. Crystalline lens                                    | 18. Hygiene, sociology, education, and history         |
|  | 19. Anatomy, embryology, and comparative ophthalmology |

### 1

#### GENERAL METHODS OF DIAGNOSIS

Crawford, H. E. Biomicroscopic surgery and treatment. *Arch. of Ophth.*, 1944, v. 32, Sept., pp. 215-216.

The author tells how he uses the biomicroscope in removal of foreign bodies of the cornea, treatment of ulcers, removal of sutures, and epilation of misplaced cilia. (2 references.)

R. W. Danielson.

Crisp, W. H. Pitfalls of the general physician in ocular diagnosis. *Rocky Mountain Med. Jour.*, 1944, v. 41, Sept., pp. 626-633. (See Section 18, Hygiene, sociology, education, and history.)

Disler, N. N. The unfrosted electric lamp in ocular practice. *Viestnik Oft.*, 1943, v. 22, pt. 4, p. 31.

Because of its greater intensity of illumination, Disler advocates the use of the unfrosted electric bulb for inspection of the eye, for oblique illumination, for indirect ophthalmoscopy, and for the hand slitlamp. An electric bulb with a filament of two or three coils is

more suitable than one with a longer filament. To provide a brightly illuminated area similar to that obtained with the slitlamp, a diaphragm with a slit over the bulb was designed by Disler in 1935. Such illumination is easily arranged where a slitlamp is not available, as for instance in field hospitals, and is helpful in the diagnosis of the varied ocular injuries seen at the front. With this illumination one can see the details of the iris, the lens, and the anterior portion of the vitreous body. The bulb may also be used for diaphanoscopy in outlining the presence of foreign bodies in cornea, iris, and lens.

Ray K. Daily.

Ellis, O. H. A new goniotomy lens. *Amer. Jour. Ophth.*, 1944, v. 27, Nov., pp. 1258-1265. (4 illustrations, fields, references.)

Feldman, J. B. An absolute monochromatic ophthalmoscope. *Arch. of Ophth.*, 1944, v. 32, Sept., pp. 213-214.

The author gives a description of an ophthalmoscope designed by himself. With this instrument it is imperative

that unfiltered light be never used; otherwise retinal damage will result. The instrument is of value not only as an ophthalmoscope, but also to illuminate the lens in surgery. Some surgeons use only ultraviolet rays after operations for cataract, to determine whether all the lens matter has been removed. The author, however, has found monochromatic yellow of greater value in illuminating the field after extraction of a cataract. The monochromatic ophthalmoscope is of value in questionable fundus cases, by making pathologic conditions stand out more prominently. (One illustration.)

R. W. Danielson.

## 2

### THERAPEUTICS AND OPERATIONS

Adamiuk, V. E. Therapeutic transplantation of skin. *Viestnik Oft.*, 1943, v. 22, pt. 4, p. 12.

Adamiuk, to simplify the procedure introduced and popularized by Filatov, shortens the period of conservation of the transplanted skin from several days to several hours. For traumatic corneal opacities he transplants a small piece of skin under the upper outer part of the bulbar conjunctiva. Absorption of the implanted skin releases a number of biologic products which stimulate absorption of the corneal opacities. In cases in which the implant is absorbed rapidly a second implantation may be made. Whether the patient's own skin is just as effective as skin taken from another person and whether delayed absorption produced by rolling the transplant into a tube would be of advantage are problems to be solved in the future.

Ray K. Daily.

Bellows, J. G. Penicillin therapy in ocular infections. *Amer. Jour. Ophth.*,

1944, v. 27, Nov., pp. 1206-1218. (11 tables, references.)

Carreras, B. How to prevent hemorrhagic complications in orbital anesthesia. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1943, v. 3, Nov.-Dec., pp. 419-424.

The occurrence of orbital hemorrhage is very annoying although infrequent. To prevent these hemorrhages it is proposed that a sharp needle be used only for injecting novocaine beneath the skin. The deep injection is then made with a needle whose point has been blunted on a stone.

J. Wesley McKinney.

Cordes, F. C. Fever therapy in ophthalmology. *Jour. Amer. Med. Assoc.*, 1944, v. 124, Jan., pp. 14-23.

With a review of the literature, the author discusses the mechanism of the beneficial effect of foreign-protein therapy. He concludes that milk injections are of particular value in the treatment of infants; fever enhances the action of sulfonamides given concurrently. Although diphtheria antitoxin has many disadvantages, its use in sympathetic ophthalmia seems justified. Typhoid vaccine is the most widely useful agent, and small doses administered over a longer period of time seem as effective as larger, more shocking doses. Coley's mixed toxins are advisable when a milder fever is indicated or the use of typhoid vaccine is not warranted. Omnadin has some value in producing leucocytosis and a rise in the antibody content of the blood. The use of malaria is not justified for ophthalmic diseases. Hyperpyrexia induced by high-frequency methods is still in the experimental stage and further research is needed. Among physical means production of

fever is best obtained by air-conditioned cabinets of the Kettering type. It is most efficacious in gonorrheal and syphilitic diseases of the eye. (Discussion, bibliography.)

Robert N. Shaffer.

Crawford, T., and King, E. F. The value of penicillin in the treatment of superficial infections of the eyes and lid margins. *Brit. Jour. Ophth.*, 1944, v. 28, Aug., pp. 373-383.

Penicillin used locally as a solution (250 units of c.c.) or as an ointment (250 units per gm. of 30-percent lanette wax in water) was found to excel any therapeutic agent hitherto employed in the treatment of superficial infections of the conjunctiva, cornea, and lid margins. It also proved effective in stubborn cases which were resistant to other forms of treatment, sterile cultures being obtained within a few days after treatment was started. No case due to a penicillin-resistant organism was found. The four cases which showed recurrence after cessation of treatment were all due to organisms as sensitive to penicillin as those causing the original infection.

Penicillin proved just as effective in clearing up cases of conjunctivitis associated with skin lesions (seborrheic dermatitis, acne rosacea) as in uncomplicated cases. (6 tables, references.)

Edna M. Reynolds.

Knapp, F. N. Treatment of ocular tuberculosis. *Arch. of Ophth.*, 1944, v. 32, Sept., pp. 196-203.

After a review of the literature and reports of several cases, the author gives the following personal opinions as to the treatment of ocular tuberculosis: Rest in bed in a sanatorium or at home is urged. A high vitamin and high caloric diet is advisable. Radium

treatment is at times advisable, the beta rays for the cornea and the gamma rays for the more deep-seated lesions. Roentgen rays may also be utilized, although in general this therapy is only moderately effective and is usually limited to rather small and repeated doses. For chronic inflammatory lesions of the eye, the dose should be larger than for acute conditions, but it should never be so large as to endanger the structures of the most sensitive ocular parts, namely, the conjunctiva and the crystalline lens. Gold sodium thiosulfate is of value in some cases, although unfortunate local and general reactions have occurred. The author at times uses typhoid H antigen as advocated by Brown.

Mantoux diagnostic tests may be carried out by use of Seiber's purified protein derivative or old tuberculin. In the treatment of patients with ocular tuberculosis the aim is to cure by general treatment of the entire process in the organism, and not by treatment only of the local disease. Two main clinical groups of ocular tuberculosis stand in therapeutic opposition: on the one hand, malignant, exudative forms with the subjects toxin-sensitive, calling for conservative, general, and local treatment; on the other hand, benign, productive, or fibrous forms, with the subjects less toxin-sensitive, indicating a more aggressive therapy. (References, 2 illustrations, 1 in color.)

R. W. Danielson.

Mathewson, W. R. Vitamin P in ophthalmology. *Brit. Jour. Ophth.*, 1944, v. 28, July, pp. 336-346.

Two cases of ocular hemorrhage are reported in which vitamin P was used with satisfactory results. The first case was that of a patient with multiple myelomata accompanied by subarach-



noid hemorrhage, retinal venous thrombosis, and retinal hemorrhages. Nasal and bladder hemorrhages were also present. When vitamin P was given, the bladder and nasal hemorrhages ceased. No new retinal hemorrhages occurred, and those already present were absorbed. During temporary suspension of vitamin P, nasal hemorrhages recurred, but they ceased when administration of vitamin P was resumed. The patient had had X-ray therapy for the myelomata, so the question arises whether the increased capillary permeability was due to the disease itself or to the X-ray therapy. It is suggested that in myelomata and other conditions vitamin P may be used to lessen the danger of hemorrhage after X-ray treatment.

The second case reported was one of recurrent hemorrhages into the anterior chamber after cataract extraction. With the use of vitamin P the blood rapidly disappeared from the anterior chamber and the patient's general condition improved markedly. It is suggested that vitamin-P deficiency, as well as vitamin-C deficiency, may be a factor in the causation of cataract. (3 charts.) Edna M. Reynolds.

Moreu, Angel. A new model table for ocular operations. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1943, v. 3, Nov.-Dec., pp. 489-493.

The author's description is accompanied by photographs.

Oliveres, A. Preservation of zinc sulphate collyrium. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1943, v. 3, Nov.-Dec., pp. 449-451.

Preparations of zinc sulphate soor show a precipitation due to action of the air, of the alkaline glass, and of contamination by organic material. Ex-

periments were made with several preservatives and salicylic acid in 1 to 2000 strength was found to be the best. By adding this drug a clear stable solution was obtained, whose therapeutic effect remained unaltered indefinitely.

J. Wesley McKinney.

Riser, R. O. Modern trends in ocular therapeutics. *Arch. of Ophth.*, 1944, v. 32, July, pp. 70-75.

This material taken from recent literature gives an excellent list of powders, creams, pastes, refrigerating pastes, and ointments, intended for use on the eyelids. The therapeutic agents used systemically and locally in glaucoma are well classified and presented. A review of the indications for use of the sulfonamides includes reprinting of the excellent table presented by Thygeson. Under the heading of "better eye drops," Riser discusses tonicity, hydrogen-ion concentration, buffer solutions, preservatives, substitutes for tears, surface tension, and wetting agents.

A tabulation is given of the recommended hydrogen-ion concentrations in terms of the pH of various forms of buffered eye-drops. One may buffer one's own solutions, or one may specify Gifford's buffer solution or Feldman's buffer solution to the druggist. (References.)

R. W. Danielson.

Selfa, Enrique. The local use of the sulfonamides in some ocular affections. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1943, Nov.-Dec., v. 3, pp. 442-448.

Local application of the sulfonamides brings a high concentration to the tissues, and in external ocular affections it may be superior to use of the drug by mouth. Eight cases of acute conjunctivitis, three with pseudomembrane and

five without pseudomembrane, were observed. All responded rapidly to the use of sulfathiazole ointment locally. Of 12 cases of phlyctenular disease all but one responded well to sulfathiazole ointment. The response was much more rapid than that previously obtained with yellow oxide of mercury and calomel. Local application was very effective in inclusion blennorrhea and in gonorrheal ophthalmia of the newborn, and it is suggested that local application of sulfathiazole ointment might be more efficacious than silver nitrate in prophylaxis. In Koch-Weeks infection also sulfathiazole was effective, but in Morax-Axenfeld conjunctivitis no benefit was obtained.

J. Wesley McKinney.

Swan, K. C. Reactivity of the ocular tissues to wetting agents. *Amer. Jour. Ophth.*, 1944, v. 27, Oct., pp. 1118-1122. (3 figures, references.)

Von Sallman, L. (with technical assistance of J. Di Grandi). Simultaneous local application of penicillin and sulfacetimide. *Arch. of Ophth.*, 1944, v. 32, Sept., pp. 190-192.

This paper deals with (1) preliminary experiments to determine compatibility of penicillin and sulfonamides in vitro, (2) iontophoretic application to rabbit eyes of a solution containing penicillin and a sulfonamide compound, and (3) the comparative effect of three types of therapy on a staphylococcic endophthalmitis produced in chinchilla rabbits.

It was found that sulfadiazine and sulfacetimide did not exert noticeable antagonistic effect on the bacteriostatic activity of penicillin in vitro. A single injection of 0.2 c.c. of a 10-percent solution of sodium sulfacetimide led to high concentration in the vitreous

and a lower in the aqueous, the level in the vitreous being close to 15 mg. per 100 c.c. 72 hours after injection.

Damage attributable to penicillin was limited in general to a slight inflammatory reaction without integral lesions of retina, lens, or vitreous. Repeated intravitreal injection occasionally caused permanent lesions of retina or lens. The irritation following injection of sulfacetimide was usually greater than following penicillin.

A reliable standard infection of the vitreous leading to phthisis bulbi was produced by intravitreal injection of 0.05 c.c. of a broth culture of *Staph. aureus* in a dilution of  $10^{-4}$ . This infection was checked in all instances by penicillin if injected into the vitreous six or twelve hours after the inoculation; but the treatment was only of slight benefit when initiated 24 hours after inoculation. The infection was not influenced by intravitreal injection of sodium sulfacetimide six hours after the inoculation. (4 tables, 3 figures, references.)

R. W. Danielson.

Von Sallman, L., Meyer, K., and Di Grandi, J. Experimental study on penicillin treatment of ectogenous infection of vitreous. *Arch. of Ophth.*, 1944, v. 32, Sept., pp. 179-189. (See Section 10, Retina and vitreous.)

### 3

#### PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Enos, M. V. Suppression versus amblyopia. *Amer. Jour. Ophth.*, 1944, v. 27, Nov., pp. 1266-1271. (One table.)

Kekcheyev, K. Problem of night vision. *Amer. Review of Soviet Med.*, 1944, v. 1, April, p. 300. (See *Amer. Jour. Ophth.*, 1943, v. 26, Nov., p. 1236.)

Lancaster, W. B. Present status of eye exercises for improvement of visual function. *Arch. of Ophth.*, 1944, v. 32, Sept., pp. 167-172; also *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1944, 48th mtg., p. 413.

Lancaster stresses the thesis that seeing is only one half ocular, the other half cerebral. There is abundant evidence for the general proposition that exercises, repetition, practice, and learning lead to better performance, to the acquisition of skill. Repetition and practice build up a substratum of memories useful for interpretation of sensations and facilitate the syntheses which are the major part of seeing. Motor functions are perfected by practice, and reflex pathways are facilitated. Ophthalmologists have concentrated their attention on the primary source of the sensation.

Lancaster is skeptical of actual structural changes being wrought by exercises, apart from the hyperplasia and hypertrophy of muscles and the consequent changes induced in tendons and perhaps in bones. Some clearing of corneal opacities often occurs, but not by means of exercises. It is doubtful that any changes in size or shape of the eyeball are brought about by such means. The burden of proof is on those who make such claims. (References.) R. W. Danielson.

McEachern, D., Layton, B. D. B., and Burr, E. G. Canadian Army night-vision training and testing unit. *War Med.*, 1944, v. 5, May, pp. 283-291.

The Canadian Army has developed a night-vision training and testing assembly, the operation of which is described. A preliminary group-training session uses landscape silhouettes projected at low brightness. The men are then tested individually. By the test

procedure men can be divided into four groups as regards night visual-acuity. The test-retest reliability appears to be satisfactory. The initial test will place a soldier in his proper category or on occasion in a category just below it. In no case has the initial test been shown to overrate the night visual acuity. Some units are mobile and equipped with portable dark room. Specially prepared silhouettes are used for the training of men on specific schemes or objectives. This form of training bears the same relationship to night field schemes as the sand table does to daytime maneuvers. (4 figures, 3 tables.) M. Lombardo.

Mayer, L. L. Effect of diethylstilbesterol on accommodation. *Arch. of Ophth.*, 1944, v. 32, Aug., pp. 133-134.

The author has noted a number of women with weakened accommodation, apparently the result of the administration of diethylstilbesterol. Five illustrative cases are reported. In most instances the androgen was administered for the relief of menopausal symptoms in patients presenting some degree of presbyopia. In these patients, a stronger reading addition was required than normal for their age. One of the patients was a 16-year-old girl whose near point had receded to 38 cm. In her, as in some of the older women, accommodative power returned to normal after administration of the drug was stopped. The use of diethylstilbesterol is known to be attended by some undesirable reactions, including, in order of frequency, nausea, vomiting, headache, vertigo, abdominal distress, diarrhea, and dermatoses. This article presents the first record of any ocular complication from the use of the drug. (References.) John C. Long.

Pascal, J. I. Intrinsic variability of astigmatic errors. *Arch. of Ophth.*, 1944, v. 32, Aug., pp. 123-124.

The variable factor occurs in the astigmatic correction at the plane of the correcting lens. When properly corrected for distance, the astigmatic eye develops a new astigmatic error when accommodating for near. The amount of this astigmatism varies with the amount and kind of true astigmatism, with the position of the correcting lens, with the nearness of the object viewed, and according to whether the amount of accommodation used is related to the meridian of greatest power or the meridian of least power. The amount of this induced astigmatism is ordinarily slight but may amount to 0.5 D.

Variability in axis of astigmatism may be due to any or all of the following factors: (1) cyclophoria: when the axis is determined with one eye occluded, thereby producing dissociation, the finding will be off axis to the extent of the imbalance; (2) the compensatory rotation of the eye when the head is tilted toward either shoulder; (3) the binocular extorsion when the eyes change from distant to near vision. The extent of change in axis may possibly amount to 5 or 10 degrees.

In general, these variations in astigmatism do not cause any special distress except in hypersensitive eyes. Should the determination of axis be somewhat variable when tested at 20 feet, it would be better to select the more temporal position for the correction, in line with the physiologic extorsion. As near vision is generally more important, one might obtain a correction compromise by determining the astigmatic correction at some intermediate point, such as 40 or 50 cm. It should be possible to avoid the error

induced by cyclophoria, by locating the astigmatic axis during binocular fixation. John C. Long.

Pérez Llorca, J., and Jiménez Almenara, J. Changes in the index of refraction of the ocular media in animals given sulfonamides. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1943, v. 3, Nov.-Dec., pp. 425-431.

To determine whether a change in index of refraction might be the cause of the reported cases of myopia occurring in the course of sulfonamide therapy, the authors carried out several experiments on ox eyes in vitro. Increasing amounts of albucid and neopental were injected into the anterior chamber. No appreciable increase in index of refraction was noted. The cornea, lens, and vitreous were submerged in various concentrations of the same drugs for 24 hours, but again no appreciable increase in the index of refraction was noted.

J. Wesley McKinney.

Prado Durval. Let us rationalize our optometric scales. *Arquivos Brasileiros de Oft.*, 1944, v. 7, June, pp. 89-94.

The author is impressed by certain inconveniences in the use of letters for these scales, such inconveniences being related especially to the variable recognizability of the letters, to the facility with which they are memorized, and to the impossibility of their use with illiterates. The relative merits of the Landolt broken circle, the illiterate "E" of Snellen, and the open square of de Wecker are discussed. Prado also argues in favor of a test card graduated in 15 steps from 0.1 to 2.00 (0.1, 0.15, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1, 1.25, 1.50, 1.75, 2), because a number of individuals have acuity a good deal above Snellen's so-called normal or unity.

The Snellen illiterate "E" is particularly favored, and a new scale has been printed by a firm in the author's home town, São Paulo, Brazil. (2 figures, references.)

W. H. Crisp.

Sergievsky, L. I. Shortening the period of atropine cycloplegia by means of weak solutions of eserine. *Viestnik Oft.*, 1943, v. 22, pt. 3, p. 35.

With the above objective 0.25 percent eserine was used on 76 patients, and 0.5 percent on 27, the age of the patients varying from six to forty years. These patients had received instillations of 1 percent atropine for ten days, for refraction. During the first day the instillations of eserine were made five or six times; during the following days, as needed; the need being determined by inability to accommodate, and not by the size of the pupil.

The data show that it is possible to restore the function of the internal ocular musculature of the normal uninflamed atropinized eye in one day by instillations of weak solutions of eserine. In some cases final abolition of cycloplegia may be delayed six or seven days. The criterion of restored function was ability to read for eight hours, or the working day. Patients able to read for eight hours are considered able to work, even if at the end of the eight hours the action of eserine ceases. The effect of eserine on the atropinized ocular musculature increases with the number of instillations, setting in more rapidly and holding longer. It is suggested that in first-aid stations of industries and schools the failing effect of eserine may be restored by a single instillation. Ability to read for eight hours was attained within three days by instillation of 0.25 percent eserine; thus after three days

use of this drug workers and children may be returned to industry and school, respectively, provided they are supplied with eserine for use as needed. The effect of eserine varies in different people, and in the same person it may affect the pupil and accommodation differently. There was no significant difference in the effect of 0.25 percent and 0.5 eserine on the cycloplegia, but the disagreeable sensations caused by eserine are more frequent with the use of the stronger solution.

Ray K. Daily.

Sloane, A. E. Refraction clinic. *Amer. Jour. Ophth.*, 1944, v. 27, Nov., pp. 1287-1289.

#### 4

#### OCULAR MOVEMENTS

Burian, H. M. Motility clinic. Concomitant convergent strabismus with overaction of the inferior oblique muscles and dissociated vertical divergence. *Amer. Jour. Ophth.*, 1944, v. 27, Nov., pp. 1284-1287. (3 figures.)

Crowe, M. P. Familial spastic paresis with strabismus. *Arch. Dis. in Childhood*, 1944, v. 19, March, p. 32.

The presence of different degrees of weakness of spasticity, and of adduction deformity of the lower limbs in the five children of a family is described. Signs of an upper-motor-neuron lesion are present in all five. This condition, first noticed in infancy and presumably present antenatally, resembles the clinical entity described as Little's disease, with, in addition, the presence of ocular manifestations.

The occurrence of the five cases in one family would seem to exclude an infective or traumatic etiology, and the origin probably is, as described by

Collier, "a primary neuronc degeneration due to factors which are at present entirely elusive." Different degrees of hypermetropia, accompanied by loss of vision, exist in each child, and strabismus is present in four. Visual acuity is about 6/12 in each case.

An obscure common deprivation process may exist. Since neither the parents nor the grandparents have similar defects, any genetic factor responsible would seem necessarily to be of the recessive rather than the dominant type. But the parents are not related.

Theodore M. Shapira.

Da Luz, Barbosa. More concerning strabismus. *Rev. Brasileira de Oft.*, 1944, v. 3, Sept., pp. 13-22.

A brief review in somewhat general terms, with several quotations from the literature of strabismus, is accompanied by the statement that orthoptic training is valuable not merely in strabismus but in some cases of asthenopia without error of refraction but with poor binocular fusion. (References.)

W. H. Crisp.

Enos, M. V. Suppression versus amblyopia. *Amer. Jour. Ophth.*, 1944, v. 27, Nov., pp. 1266-1271. (One table.)

Faulkner, S. H., Scully, E., and Carter, E. E. Operations on one hundred cases of convergent concomitant squint. *Brit. Jour. Ophth.*, 1944, v. 28, Aug., pp. 403-407.

To show the degree of success which can be obtained by operation combined with orthoptic treatment, 100 consecutive cases among children from six to 14 years of age at the Salford Municipal Hospital are reported. Forty-five of the cases showed satisfactory binocular vision at the angle of squint.

The first operations carried out were:

advancement and recession 48, bilateral recession 32, bilateral advancement 6, single advancement 8, single recession 4, single recession and myectomy of inferior oblique 1, myectomy of inferior oblique 1.

In 92 of the cases the eyes were rendered approximately straight by operation and orthoptics. One patient considered to be a case of psychologic squint was unimproved by a second operation. The other seven relatively unsatisfactory cases would probably have responded to further operation.

Edna M. Reynolds.

Hughes, W. L. Recession of the trochlea for reducing the action of the superior oblique muscle. *Amer. Jour. Ophth.*, 1944, v. 27, Oct., pp. 1123-1131; also *Trans. Amer. Ophth. Soc.*, 1943, v. 41, p. 307. (10 figures, references.)

Krewson, W. E., 3. Comparison of the oblique extraocular muscles. *Arch. of Ophth.*, 1944, v. 32, Sept., pp. 204-207.

This article compares and contrasts the anatomy and physiology of the two oblique extraocular muscles. The superior oblique is the longest muscle in the orbit, the inferior oblique the shortest. The superior oblique has the longest tendon of all the extraocular muscles but no check ligament, while the inferior oblique muscle has no tendon but the longest check ligament. The superior oblique muscle has the most variable insertion, the line being usually on the vertical meridian, anterior to the vortex veins; the inferior oblique muscle has the most constant insertion, being located on the horizontal meridian and posterior to the vortex veins. The superior oblique muscle has a contralateral innervation, while the inferior oblique muscle has an ipsilateral

or a bilateral representation. The superior oblique muscle acts as a depressor, the inferior oblique as an elevator; their respective actions increasing as the eye turns inward and decreasing as the eye turns outward. The former acts as an intorter, the latter as an extorter; both torsional actions increasing as the eye is turned outward and decreasing as it is turned inward.

Both muscles are reputed to act as external rotators, the action increasing as the eye turns outward and decreasing as the eye turns inward. In the case of the inferior oblique, however, there may be some question whether it acts as an internal or an external rotator. The superior oblique is the second most frequently paralyzed muscle; the inferior oblique the least frequently involved, the lesion being then often accompanied by internal ophthalmoplegia. Vertical diplopia is greater with paralysis of the inferior oblique than with paralysis of the superior oblique. The false image pointing to paralysis of the superior oblique leans to the normal (opposite) side, and that related to the inferior oblique leans to the affected (same) side. (References.)

R. W. Danielson.

McCaslin, M. F. The orthoptic treatment of the phorias. *Amer. Jour. Ophth.*, 1944, v. 27, Nov., pp. 1272-1273.

Paiva, Clovis. Congenital paralysis of the external rectus; Duane's syndrome. *Rev. Brasileira de Oft.*, 1944, v. 3, Sept., pp. 25-29.

Under this ambitious title the author discusses the case of a 14-year-old girl who showed an apparent congenital paralysis of the right external rectus, with slight narrowing of the right palpebral aperture. There was also a

facial asymmetry, the right orbit being definitely more posterior than the left. (3 photographs.)

W. H. Crisp.

Posner, Adolph. Divergence excess considered as an anomaly of the postural tonus of the muscular apparatus. *Amer. Jour. Ophth.*, 1944, v. 27, Oct., pp. 1136-1142. (References.)

Posner, Adolph. Noncomitant hyperphorias. *Amer. Jour. Ophth.*, 1944, v. 27, Nov., pp. 1275-1279. (References.)

Shure, I. I. Strabismus in adults. *Arch. of Ophth.*, 1944, v. 32, Aug., pp. 113-119.

This is an analysis of results in 65 cases of strabismus in adult males, all of whom underwent operative procedures and received orthoptic treatment. Each case was refracted under cycloplegia, the amount of deviation measured, the near point of convergence determined, the degree of fusion measured, and the presence or absence of anomalous retinal correspondence noted. The surgical procedure consisted of recession of one muscle often combined with resection and advancement of the opposite muscle. No patient in the entire series was dismissed until a thorough attempt had been made to develop fusion. Each patient was given orthoptic training with the stereoscope on removal of the bandages, usually about 48 hours after operation. Treatment consisted of two sessions of 15 minutes each day for one week, after which the periods were increased to thirty minutes. Some degree of fusion was obtained in approximately 60 percent of the cases. Amblyopia, suppression, poor fixation, and anomalous retinal correspondence were found to constitute definite obstacles

in the treatment. Transient diplopia was present in 75 percent of the cases immediately after operation. In only one case was the diplopia persistently annoying. (4 figures, references.)

John C. Long.

Thorne, F. H. Simple equipment for determining ocular-muscle efficiency. *Amer. Jour. Ophth.*, 1944, v. 27, Nov., pp. 1283-1284. (One figure.)

## 5

### CONJUNCTIVA

Benedict, W. L., and Iverson, H. A. Chronic keratoconjunctivitis associated with *Nocardia*. *Arch. of Ophth.*, 1944, v. 32, Aug., pp. 89-92.

*Nocardia*, a subdivision of the genus *Actinomyces*, has rarely been reported as a cause of ocular disease. A few cases of infection due to *Streptothrix* (a synonym for *Actinomyces*) have been recorded. The authors report an extremely chronic ocular infection associated with *Nocardia* in a Saskatchewan woman 23 years old. The disease in the eyes began at the age of seven years. There were episodes of ocular pain, lacrimation, photophobia, dimness of vision, and injection of the conjunctiva lasting from one to several weeks.

Examination revealed visual acuity of 3/60 in the right eye and 6/10 in the left. A few cilia were directed inward, and a grayish-white discharge was present. The inner surfaces of the eyelids presented either large patches of bright red granulation tissue or patches of scar. Posterior symblepharon was present. The right cornea showed finely granular infiltration throughout, as well as gross and microscopic vascularization of all parts of the cornea. During the four years that

the patient has been under observation, the condition has remained nearly stationary. Treatment with sulfanilamide, potassium iodide, zinc sulphate, and metaphen, and local application of the sodium salt of penicillin, have all failed to show any noticeable effect.

Eight cultures made during the four years have all shown an organism that should be classified as one of the *Nocardias*. This organism grows readily on all of the common laboratory media. It is a Gram-positive pleomorphic rod, which produces a typical mycelium under some growth conditions. The cultural characteristics are described in considerable detail. Inoculation in the rabbit, guinea-pig and mouse failed to produce a disease process. Corneal and conjunctival injections, in the rabbit caused no morbidity. (2 figures, references)

John C. Long.

Berens, Conrad. *Ophthalmia neonatorum*. *Amer. Jour. Obstet. and Gyn.*, 1944, v. 47, June, p. 855.

In the school year 1906 to 1907, 28.2 percent of the pupils admitted to schools and classes for the blind were blind because of *ophthalmia neonatorum*. In the school year 1941 to 1942 the percentage was 5.6. These figures emphasize the great importance of the use of silver nitrate in the prevention of *ophthalmia neonatorum* and the value of the campaign waged by the National Society for the Prevention of Blindness for use of this preventive measure. Recent studies seem to indicate that silver is still the best preventive.

While silver nitrate is readily soluble in water, its solutions may gradually become concentrated by evaporation. Silver acetate crystallizes out as soon as a concentration of 1.2 percent is reached. Thus the danger of using a too concentrated solution is entirely



precluded in the case of silver acetate.

For the sulfonamide-resistant group, penicillin seems to offer great hope. If neither sulfonamide nor penicillin proves effective, artificial-fever therapy should be considered.

Theodore M. Shapira.

Bland, J. O. W. Spontaneous folliculosis of the conjunctiva in grivet and vervet monkeys . . . and the susceptibility of the grivet to trachoma virus. *Jour. Path. and Bact.*, 1944, v. 56, April, p. 161.

In grivet and vervet monkeys folliculosis of the lids develops spontaneously and can be distinguished neither clinically nor histologically from trachoma, to which these animals are susceptible. This condition makes the grivets and vervets unsuitable for trachoma research. To infection with trachoma, grivets respond by production of follicles in the fornices of the upper lids. Inclusion bodies, however, are never found. That the follicles are trachomatous is proved by the fact that the virus remains virulent for man even after four passages, producing clinical trachoma and the presence of inclusion bodies in smears.

R. Grunfeld.

Díaz-Dominguez, D., and Arqués, E. Biomicroscopy of the corneal epithelium in conjunctival affections. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1943, v. 3, Nov.-Dec., pp. 452-457. (See Section 6; Cornea and sclera.)

Ferrer, Hector. Results obtained in the treatment of trachoma with albucid. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1943, v. 3, Nov.-Dec., pp. 432-437.

Seventeen cases are presented to demonstrate the various types and stages of trachoma. The results obtained are grouped. Large doses of

albucid (4 to 5 grams daily) were given for eight days. The subjective symptoms and corneal lesions were greatly benefited. In recent cases the conjunctival lesions were equally benefited, and the sulfonamides prepared the conjunctiva for the action of caustics and notably shortened the treatment.

J. Wesley McKinney.

Forster, W. G., and McGibony, J. R. Trachoma. *Amer. Jour. Ophth.*, 1944, v. 27, Oct., pp. 1107-1117. (4 tables, bibliography.)

Galpine, J. F., and Campbell, D. R. Unilateral membranous conjunctivitis, with complete cast. *Brit. Jour. Ophth.*, 1944, v. 28, Aug., pp. 412-414.

The patient, a girl aged six years, was hospitalized for a moderate attack of scarlet fever. After being given 3,000 units of antistreptococcic serum intramuscularly, angina and rash disappeared and a routine nose and throat culture was reported negative. Ten days later an inflammatory condition of the left eye developed, with a great deal of discharge suggestive of gonococcal ophthalmia. The lids showed a membrane, and although a culture from the eye was negative for diphtheria and positive for hemolytic streptococcus, 8,000 units of antidiphtheric serum was given as a precautionary measure. The good eye was protected with a Buller's shield. The child developed a vaginal discharge. Smears showed a large number of pus cells with organisms resembling gonococci. On culture, only staphylococcus albus grew. A second culture from the eye showed the presence of streptococci only.

A week later the membrane was so extensive that it almost hid the cornea, which had become cloudy in the lower half. The membrane was like chamois

leather and extended from the limbus as a complete lining of the conjunctival sac. At no time was the pre-auricular gland enlarged. The cornea looked as though it could not possibly survive, and 60,000 units of antidiphtheric serum was given. Two weeks after the membrane was first seen, it began to separate from the margin of the lower lid. This continued slowly, and three weeks after separation began the membrane came away as a complete cast.

Later there was recurrence of the vulvovaginitis, smears from which showed organisms indistinguishable from gonococci. The latter organisms, however, were never obtained in cultures. At the end of her stay in the hospital the child developed a high fever which persisted for twenty days. Sulfonamides were given intensively by mouth, in addition to local treatment of the eye. Examination after an interval of three months showed vision of 6/24 in the left eye, with a large degree of irregular corneal astigmatism. There was a slight opacity in the lower half of the cornea, with extensive vascularization. Edna M. Reynolds.

Pokrovsky, A. I. Pure hyperplasia, inflammatory hyperplasia, and an evaluation of trachoma. *Viestnik Oft.*, 1943, v. 22, pt. 3, p. 39.

Pokrovsky takes the position that trachoma is an inflammatory hyperplastic process, and not a pure hyperplasia, basing his opinion on the pathologic picture, the clinical symptoms, and epidemiology. After study of a large pathologic material of pure hyperplasia, as exemplified by leukomas, and of inflammatory hyperplasia as exemplified by tuberculous lymphogranulomatosis, he concludes that morphologically the changes in trachoma belong to the inflammatory

type. One of the characteristics of lymphoid tissue is its response to irritation by a lively multiplication of cells, a property common to young tissue; the conjunctiva responds to irritation in the same manner. The inflammatory hyperplasia is most apparent in follicles, which represent very young tissue; in addition to this hyperplasia there are present in the follicles and adjacent tissue also other inflammatory phenomena. The low vitality and the rapid destruction of the lymphoid tissue in trachoma follicles correspond to the process in tuberculous lymphadenitis and inflammatory lymphogranulomatosis. Ray K. Daily.

Quiroga, M. I., and Mendía, J. A. Syphilitic chancre of the palpebral conjunctiva. *Rev. Oto-Neuro-Oft.*, 1944, v. 19, May-June, pp. 81-83.

This region is one of the rarest locations for syphilitic chancre, which occurs here in less than two percent of all extragenital chancres. The mode of infection may be direct, as in kissing, removing foreign bodies with the tongue, spitting, and accidentally in perverted sex relationship; or indirect from infected objects such as towels and linens. With the chancre there is usually a pre-auricular or submaxillary adenopathy. The case of typical syphilitic chancre of the right lower palpebral conjunctiva here recorded was associated with neighboring adenopathy. Both the chancre and the lymphatic involvement cleared under arsenic and bismuth.

Edward Saskin.

Rosen, Emanuel. Nevus flammeus associated with conjunctival telangiectasia and possible early choroidal tumor. *Amer. Jour. Ophth.*, 1944, v. 27, Oct., pp. 1143-1145. (4 figures.)

Rötth, Andrew de. On the morbidity of trachoma. *Amer. Jour. Ophth.*, 1944, v. 27, Nov., pp. 1279-1282. (References.)

Selfa, Enrique. Treatment of trachoma. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1943, v. 3, Nov.-Dec., pp. 438-441.

After a brief review of the local and general use of the sulfonamides in trachoma, various well-known local measures are discussed.

J. Wesley McKinney.

Verma, O. P. Note on the treatment of angular conjunctivitis with riboflavin. *Indian Med. Gaz.*, 1944, June, p. 258.

In smears from cases of angular conjunctivitis associated with signs of riboflavin deficiency, *Morax-Axenfeld* bacilli were found in abundance. After intramuscular injection of 3 mg. of riboflavin for three days the bacilli disappeared and the smears became negative. Among the twenty cases of angular conjunctivitis so treated, two had superficial keratitis, 14 angular stomatitis with sore and fissured tongue, and three an eczematous condition of the skin.

R. Grunfeld.

Wolfe, O. D. Capillary hemangioma of palpebral conjunctiva. *Amer. Jour. Ophth.*, 1944, v. 27, Nov., pp. 1289-1291. (Four illustrations.)

## 6

### CORNEA AND SCLERA

Aparisa, Tomas. Contribution to the treatment of leprous sclerokeratitis. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1943, v. 3, Nov.-Dec., pp. 461-463.

Ocular leprosy is most frequently localized in the cornea and sclera. For

some reason the conjunctiva is rarely involved. Unfortunately treatment often fails to prevent involvement of the entire anterior segment of the globe in a repulsive leprous change. The treatment used at the Fontilles Sanatorium consists in sodium salicylate by mouth, calcium and neosalvarsan intravenously, fever therapy, and atropine and chaulmoogra oil locally. In some cases the corneal lesion is thoroughly curetted and covered with a conjunctival flap.

J. Wesley McKinney.

Ayoub, J. E. M. Desiccation keratitis. *Brit. Jour. Ophth.*, 1944, v. 28, July, pp. 347-355.

Twenty-five cases of desiccation keratitis occurring among troops fighting in the desert during the summer of 1942 are reported. The symptoms include abrupt onset of itching and smarting, with profuse lacrimation, marked photophobia, and definite visual disturbance. The objective findings are constant—episcleral injection with superficial corneal changes and irregular astigmatism.

The uniocular cases responded well to treatment by bandaging, but the bilateral cases did equally well with instillation of castor or cod-liver oil. Full mydriasis relieved the discomfort and hastened healing. In all except one case the cornea was healed and clear and the visual acuity restored to normal within from five to seven days. The etiology is probably drying of the cornea in cases of great fatigue, where the blinking reflex is reduced in frequency. (5 figures, 1 chart of clinical details.)

Edna M. Reynolds.

Brown, A. L., and Nantz, F. A. Corneal healing: adhesive power of aqueous fibrin in the rabbit. *Amer. Jour. Ophth.*, 1944, v. 27, Nov., pp.

1220-1224. (One figure, 2 tables, references.)

Díaz-Dominguez, D., and Arqués, E. Biomicroscopy of the corneal epithelium in conjunctival affections. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1943, v. 3, Nov.-Dec., pp. 452-457.

The authors report seven cases of the epithelial keratitis of Fuchs, characterized by irritation, lacrimation, photophobia, and haziness of vision. With slight injection of the bulbar conjunctiva, there were in the cornea many fine subepithelial infiltrates, more numerous at the center. The condition involved both eyes and cleared up in a few days. The causative agent is considered to be a virus. A review of the literature shows that similar superficial punctate infiltrates are encountered in epidemic keratoconjunctivitis, and often in acute conjunctivitis.

J. Wesley McKinney.

Grüter, Wilhelm. Herpetic ocular diseases in the light of modern investigations of the virus. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1943, v. 3, Nov.-Dec., pp. 494-496.

Grüter's investigations have shown that herpetic lesions of various parts of the body are caused by the same virus as is found in many corneal lesions. Inclusion bodies indicating the presence of the virus have been demonstrated in the corneal corpuscles and epithelium, and within the neurilemma sheaths of the nerves, without involving the axis cylinders. The increased cellular metabolism produces gas which causes separations of the corneal lamellae, epithelial vesicles and bullae, folds in Descemet's membrane, and lesions of the endothelium. There is a migration of monocytes into the cornea. If necrosis ensues, lymphocytes

and polynuclear cells appear. Many of these herpetic lesions are reversible. Thirteen herpetic ocular lesions are listed, including small ulcers of the lid margins, and keratitis vesiculosa, bullosa, dendritica, geografica, stellata, filiformis, striata, disciformis, parenchymatosa diffusa, endothelialis herpetica, and epidemica, as well as recurrent erosion of the cornea and herpes iridis. The treatment recommended is application of iodine to the superficial lesions and short-wave therapy to the deep lesions, the latter being based on the thermolability of the herpes virus. J. Wesley McKinney.

Jacoby, M. W., and Dominguez, R. White rings of the cornea. *Arch. of Ophth.*, 1944, v. 32, Aug., pp. 97-100.

Only a small number of cases have been reported of the characteristic opacity of the cornea first described by Coats. Two theories have been advanced as to their causation. Ballantyne conjectures that the white rings result from degenerative changes, calcareous or otherwise, in drusen of Bowman's membrane. Kuan states the belief that the lesion is due primarily to a disease of the terminal branches of corneal nerves and that this hypothetical disease may lead to necrosis of Bowman's membrane. Kuan further speculates that the ring results from a secondary change—proteic precipitation, fatty degeneration, or mineral incrustation—in the periphery of the necrosed part of Bowman's membrane. Only three authors have reported the microscopic examination of the excised rings.

Jacoby and Dominguez have had the opportunity of examining a corneal white ring in an eye that was enucleated because of complications following cataract extraction. The cornea

was immediately excised and fixed in dehydrated alcohol, and was later embedded in paraffin and sectioned. The rings were found to be made up of clusters of globules, some in Bowman's membrane but some superficial and others deep to the membrane. No hyaline masses could be seen above Bowman's membrane either inside or outside the ring. In the ring proper, where the deposit was heaviest, no trace of Bowman's membrane could be found. Various chemical tests indicate that the deposits contain calcium phosphate but no iron. Other substances must be present, as the clusters do not disappear completely under the action of acids. The findings in this case lend no support to either the theory of Ballantyne or that of Kuan. (5 photomicrographs, references.)

John C. Long.

Leopold, I. H., Holmes, L. F., and LaMotte, W. O., Jr. Local versus systemic penicillin therapy of rabbit corneal ulcer produced by Gram-negative rod. *Arch. of Ophth.*, 1944, v. 32, Sept., pp. 193-195.

Two methods of obtaining information concerning the routes of administration in experimental animals allow one to predict the results to be expected in human beings. Both methods are essential. The first is to determine the concentration reached in the cornea by the various means of administration; the second is to compare the effects of the two methods upon a standard lesion.

The experimental data of this work show that this Gram-negative organism, obtained by routine culture of material from the conjunctival cul-de-sac of rabbit eyes, is sensitive to penicillin in vitro. The experiments demonstrate that this organism can produce

a corneal lesion when injected intracorneally. Development of the lesion can be prevented by local use of penicillin but not by intramuscularly administered penicillin. Once the lesion is established, local penicillin therapy benefits its course but does not prevent the occurrence of considerable ocular damage. Intramuscularly administered penicillin does not appear to alter significantly the course of the lesion when therapy is started 24 hours after injection. The organism was sensitive to the drug in vitro and in vivo, as determined by the "well" method of Fleming and associates. (References, 1 photograph.)

R. W. Danielson.

Pérez-Buñill, A. The corneal grafting of cadaver cornea. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1943, v. 3, Nov.-Dec., pp. 464-470.

In the two cases of corneal transplantation here reported, the grafts were obtained from cadavers. The corneas of the hosts were almost totally opaque and very little improvement was obtained. J. Wesley McKinney.

Romero, Eduardo. A frequent and definite keratitis. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1943, v. 3, Nov.-Dec., pp. 458-460.

Several cases of epithelial erosion of the cornea resulting from washing the head or face in alcohol are reported.

J. Wesley McKinney.

## 7

### UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Ayberk, N. F. About the three-symp-tom-complex. *Göz Klinigi*, 1944, v. 1, no. 5, p. 197.

This is about a syndrome often called the Bechtsched syndrome. The

main factors of this syndrome are: hypopyon-iritis with tendency to relapses, aphthous disease in the mouth, and ulceration on the scrotum or in the vagina. All symptoms are caused by the same agent, which is supposed to be a virus. Inclusion bodies were found.

Joseph Igersheimer.

Crawford, Robert. A case of corpora nigra with anterior synechia. *Brit. Jour. Ophth.*, 1944, v. 28, Aug., pp. 410-412.

Both irises showed large flocculi, one being attached to the back of the cornea. This flocculus had the appearance of being slightly stretched, and showed a bifurcation near the corneal end, although the end itself, about 2 mms. in diameter, was single. There was no loose pigment in the anterior chamber. It is suggested that in this patient one of the flocculi had passed through the pupillary membrane about the fifth month (when the marginal sinus is well developed and the anterior chamber is still shallow) and so had become adherent to the cornea. A brief description of the development of corpora nigra is given. (One illustration, references.)

Edna M. Reynolds.

Kosena, E. G. The pathologic anatomy of traumatic iridocyclitis. *Viestnik Oft.*, 1943, v. 22, pt. 4, p. 33.

This is a study of transitional forms, from septic endophthalmitis to sympathetic ophthalmia. The material consisted of 700 eyes enucleated within a period of three years. In 20 of these there was clinically sympathetic ophthalmia. In the rest the enucleations were done to avoid sympathetic ophthalmia.

In 70 eyeballs the microscopic picture was that of sympathetic ophthalmia as described by Fuchs, or of a series of transitional stages between it

and Fuchs's septic endophthalmitis. Of the 20 eyeballs, enucleated because the second eye developed sympathetic ophthalmia, 15 presented the classical microscopic picture of that disorder. A group of 47 eyes showed transitional stages, consisting in some cases of tuberculoid granulomata, and in others of changes characteristic of infiltrating uveitis and choroiditis. The rest of the 70 eyes had less pronounced uveal changes. The characteristic feature was their chronicity, associated in some cases, or in some areas of the same eye, with a tuberculoid structure, and in others with a picture of lymphocytic nodules. In 8 percent of the traumatized eyes removed for fear of sympathetic ophthalmia the pathologic picture was very close to the picture described by Fuchs as found after the second eye has become involved. This indicates that the conception of sympathetic ophthalmia described by Fuchs should be extended to include transitional and abortive phases.

Kosina supports the position maintained by Rohr in 1910, that the histologic difference between sympathetic ophthalmia and fibrinoplastic inflammation is only one of degree. She also believes with Meller that the initial stage of sympathetic ophthalmia is characterized by transitional histologic forms. She suggests that further elucidation of the pathogenesis of sympathetic ophthalmia may be afforded through the study of traumatized eyes enucleated prior to the development of clinical symptoms, to prevent sympathetic ophthalmia. Ray K. Daily.

Spaeth, E. B., and De Long, P. Detachment of the choroid. *Arch. of Ophth.*, 1944, v. 32, Sept., pp. 217-238.

The clinical condition commonly spoken of as detachment of the choroid

is probably a more common manifestation of a pathologic process in the globe than is generally supposed. It occurs not only with surgical procedures perforating the eye but also as the result of severe accidental trauma to the eye. It may be either hemorrhagic or non-hemorrhagic, and it appears as a terminal phase in pathologic conditions of the uveal tract.

The authors believe that the underlying pathologic process in the choroid is the same regardless of whether the condition is serous or hemorrhagic or both, and that the immediate cause may be connected with (a) an intraocular surgical procedure; (b) traumatic perforation of the globe, of either the posterior or the anterior segment; (c) trauma to the globe without perforation; or (d) inflammatory changes, which may be acute but usually are chronic and of long standing.

After corneoscleral trephining detachment of the choroid is common. Actually, it seems to be most common after this operation.

Fuchs classified choroidal detachments as serous, hemorrhagic (due to traction by cyclitic membranes) and transudative (as in an acute inflammatory process). The authors give twelve excellent case reports illustrative of these various types, and discuss the pathology in detail. Several photomicrographs of enucleated eyes are included. (14 figures, references.)

R. W. Danielson.

Visser, M. B., and Carr, C. The rate of entrance of radio sodium into the aqueous humor and cerebrospinal fluid. *Amer. Jour. Physiology*, 1944, v. 142, Aug. 1, pp. 27-31.

The writers state that the rate of entrance of sodium isotope ions into the aqueous humor and cerebrospinal

fluid is important in connection with the mechanism of formation and the fate of these fluids. They conducted experiments to determine the rate at which  $Rd Na_{24}$  approaches equilibrium between plasma and the fluids. The movement of sodium from the blood into the aqueous and the cerebrospinal fluid was studied in dogs of 10 to 20 kg., after intravenous injection of suitable amounts of the radio isotope as sodium chloride in an isotonic solution. After injection the blood level of  $Rd Na_{24}$  was determined on samples of arterial blood drawn from the femoral artery. The blood was rendered incoagulable by oxalate, and plasma was used for analysis. At various times after the injection the aqueous was withdrawn from each eye and the cerebrospinal fluid from the cisterna magna. The results, presented in tabular form, show an approach toward equality of  $Rd Na_{24}$  concentrations in plasma and aqueous over an hour after injection in animals anesthetized with nembutal, while in animals on which local anesthesia was used this rate was lower. The entrance of  $Rd Na_{24}$  into cerebrospinal fluid was much slower than into the aqueous. After lengthy discussion of the results obtained the writers admit that while the experiments reported in their paper add information concerning the problems of the mechanism of formation and absorption of the aqueous they do not permit a choice as to which is the more acceptable assumption. (References, 1 figure.)

M. Lombardo.

## 8

### GLAUCOMA AND OCULAR TENSION

Rodigina, A. M. Bilateral infantile glaucoma associated with bilateral hemangioma congenitale (nevus flam-

meus). Arch. of Ophth., 1944, v. 32, Sept., pp. 214-215.

The author's case resulted in complete blindness at the age of 11 years. (One reference, 2 figures.)

R. W. Danielson.

## 9

### CRYSTALLINE LENS

Archangelsky, V. H. Prophylaxis in intraocular surgery. Viestnik Oft., 1943, v. 22, pt. 4, p. 14.

Archangelsky advocates the use of a large preliminary conjunctival flap and a keratome-scissors incision in cataract extraction, as prophylactic against intraocular infection. The large conjunctival flap complicates somewhat the opening of the anterior chamber, but this difficulty is compensated for by the ability to make the incision exactly at the limbus, by having the surgical field completely isolated from the conjunctival surface, by complete closure of the wound, by firm coaptation of the lips of the wound, by isolation of the anterior chamber from the conjunctival sac immediately after the operation, by formation of a thin cicatrix, and by a less astigmatic postoperative correction.

Ray K. Daily.

## 10

### RETINA AND VITREOUS

Ayres, Francisco. Ophthalmoscopy in the hypertensions. Arquivos Brasileiros de Oft., 1944, v. 7, June, pp. 95-110.

The author quotes extensively from various writers on the subject. (Nine illustrations, references.)

W. H. Crisp.

Bedell, A. J. Ophthalmoscopic signs of terminal hypertension. New York

State Jour. of Med., 1944, v. 44, Aug. 1, p. 1675.

The author records 11 cases demonstrating ophthalmoscopic signs of terminal hypertension. The discussion is confined to only one phase of the immense problem of hypertension, namely what fundus signs suggest a serious outcome. Patients are separated into those who come early, when there is still time to give advice as to how to live; those who are seen when only by extremely good care can death be delayed even for a short period; and those who are already dying. The author points out that it is unwise to consider papilledema, or choked disc, as caused by hypertension until brain tumor has been excluded with exhaustive tests. The author's object is to show how fundus changes aid in arriving at an opinion as to the probable duration of life.

Theodore H. Shapira.

Gözcü, N. I. Retinal hemorrhages as complication of malaria. Göz Klinigi, 1944, v. 1, no. 5, p. 187.

Ocular complications are rare in malaria. They may be caused by the parasites themselves or may be a consequence of malarial anemia. The author reports two cases with retinal and preretinal hemorrhages. In the first case some of the hemorrhages showed whitish centers, in the second case there was a group of whitish spots around a preretinal hemorrhage. In this second case the general anemia was very marked and therefore the whole retina was very pale. Joseph Igersheimer.

## 12

### VISUAL TRACTS AND CENTERS

Popov, M. Z. Pathogenesis of the fundus changes in complicated cranio-cerebral injuries. Viestnik Oft., 1943, v. 22, pt. 4, p. 19.



The fundus picture in infected wounds with large osteodural defects is different from that seen in noninfected wounds with insignificant osteodural damage. In the author's material, infected wounds of the brain associated with large osteodural defects showed rapidly a papillitis in the contralateral eye; while on the injured side there appeared only a slight blur of the temporal side of the disc, a filling of the excavation, and a slight constriction in the caliber of the veins. As the intracranial process progressed the contralateral papillitis increased. On the injured side there was a hyperemia of the optic nerve, with increased blurring of the temporal edges of the disc and obscuration of the venous and arterial contours. The blood column of the veins became dull in the lower half of the disc, giving the impression of a diminished blood supply in this region.

In cases in which necrosis of brain tissue opened the ventricles and cerebrospinal fluid drained away, swelling of the disc and haziness of its contours diminished, the excavation of the nerve became distinct, and hyperemia subsided, but the haziness of the vascular contours persisted. Microscopically, in a fatal case the perineural spaces of the optic nerves were found infiltrated with round cells.

The fundus picture in cases of small noninfected craniocerebral wounds with insignificant osteodural defects was that of choked disc, differentiating this picture from that seen in septic processes, in which the veins are narrowed. In some of the aseptic cases there was a profuse exudate on the disc in the form of dots and striae, and small hemorrhages around the disc. Endophlebitis appeared early, giving the veins a segmented appearance. The ocular symptoms became more pro-

nounced, with diminution of the cerebral pulse, increased dural tension, intense headache, and necrosis of the prolapsed brain.

The author explains the pathogenesis of the fundus picture as follows: The brain reacts to every trauma with edema and increased intracranial pressure. The edema decreases the elasticity of the brain and reduces the amplitude of its pulsations. This diminishes its aspirating action on the centripetal fluid surrounding the optic disc, and produces venous dilatation and stasis similar to choked disc. In large osteodural defects the intracranial pressure is diminished and the fundus changes are less pronounced. In septic processes there is, in addition, the destructive action of a toxic infective agent on the capillary membrane. It disturbs the normal exchange of fluid between the capillaries and the brain tissue, and albumin appears in the cerebrospinal fluid. Albumin also appears in the intercellular spaces of the brain, in the spaces of the optic nerve, and in the perivascular spaces; the dilatation of the perivascular spaces causes the venous constriction seen in the fundus.

The presence in some aseptic cases of exudates and hemorrhages on the surface of the disc is associated with the development of venous dilatation, slowing of the blood current, and increased permeability of the capillary endothelium.

Ray K. Daily.

### 13

#### EYEBALL AND ORBIT

Abdulaev, G. G. Enucleation of the shrunken eyeball. *Viestnik Oft.*, 1943, v. 22, pt. 4, p. 21.

After enucleating a series of shrunken and torn eyeballs, the author recom-

mends the following technique: preliminary pantopon or morphine injection; anesthesia through the skin, pushing the needle close to the orbital walls; and producing diffuse infiltration of the retro-ocular tissues; another injection through the scleral conjunctiva to anesthetize the anterior ocular segment. Lid elevators provide a more convenient field than a blepharostat. The conjunctiva is separated from the corneal remnant and the ocular muscles are separated from the eyeball, leaving all cicatricial tissue attached to the eyeball. The optic nerve is sectioned, the eyeball removed, and the conjunctival wound closed horizontally with a continuous silk suture. In primary enucleations the author uses no sutures, but in shrunken eyeballs the cicatricial edges of the conjunctiva unite better if sutured, and leave a better stump.

Ray K. Daily.

Brown, A. M. Protheses for the eye and orbit. *Arch. of Ophth.*, 1944, v. 32, Sept., pp. 208-212.

Most commonly a prothesis is needed only after surgical exenteration of the entire orbital contents. In this process, two overcorrections are necessary. First, the entire orbit should be sculptured slightly higher on the face than its opposite; second, the conjunctiva should be slightly more visible in the prothesis than in the normal eye.

Negocoll was formerly used for making impressions, but was not entirely satisfactory since it had to be cooled to a desirable temperature and then used quickly within the critical period, the margin for error being rather narrow.

Modern compounds for negative impressions are greatly improved. They are supplied in the form of molding powders and require mixing with dis-

tilled water only. They are then spatulated to a smooth, air-free mixture, and the casting of the impression is done in the usual manner. These compounds require no special equipment and produce accurate, detailed impressions of eyes without bad aftereffects.

The author emphasizes that in sculpturing restorations the objective is not to create a beautifully modeled part which attracts attention and admiration but to fashion a restoration that will permit the patient to become inconspicuous. (6 photographs.)

R. W. Danielson.

Sverdlov, D. G. Techniques of enucleation, and improvement of the cosmetic result. *Viestnik Oft.*, 1943, v. 22, pt. 4, p. 22.

The author urges the use of cadaver cartilage as implantation material in enucleations, and in plastic operations for improving an unsatisfactory stump. In injured eyes with torn conjunctiva it is important to introduce a prothesis at once or soon after the operation. Failure to do so produces distortion of the conjunctival sac by adhesions, which can be corrected only by further surgery.

Ray K. Daily.

## 14

### EYELIDS AND LACRIMAL APPARATUS

Katznelson, A. B. When should restorative lid surgery be done. *Viestnik Oft.*, 1943, v. 22, pt. 4, p. 3.

After twenty months of war surgery done both early and late, Katznelson is convinced that early is to be preferred to late plastic repair. The most favorable time is when the wound has just closed and is not yet completely covered with epithelium. Early plastic surgery eliminates excision of the cicatrix, and the bed of the transplant is

formed by a cellular highly vascularized granulation tissue, which insures nutrition and vascularization of the transplant. Katznelson uses free skin-transplants from the back of the ear and the mastoid. In firearm injuries of the face the wounds are frequently very extensive and deep, reaching to the bone and sinuses. Resection of cicatrices in such areas may expose the nasal cavities and sinuses, and leave a very unfavorable bed for the transplant. Experience has proved that the transplant does not shrink after early surgery. It appears to the contrary that transplantation has a favorable effect on immature cicatricial tissue, and stimulates its absorption.

Ray K. Daily.

Leoz Ortín, G. Abortive treatment of acute dacryocystitis. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1943, v. 3, Nov.-Dec., pp. 476-486.

Acute dacryocystitis may occur in three forms: (1) catarrhal inflammation of the mucosa of sac and duct; (2) pericystic phlegmon with or without eventual abscess formation; (3) combined inflammation of the mucosa and of the surrounding tissue. In the first type, the primary consideration is establishment of adequate drainage by introducing drops of cocaine and adrenaline into the sac, followed by massage and irrigation. After the sac is completely emptied a few drops of 2 or 3 percent silver nitrate are instilled. The treatment is carried out daily, and as the inflammation subsides cyanide of mercury or zinc sulphate replaces the silver nitrate. In a purely pericystic inflammation wherein fluid passes freely into the nose, the treatment is that of any phlegmon. If suppuration ensues, the abscess is incised without entering the sac. If the inflammation is

both intracystic and extracystic, incision carried into the sac is usually necessary. J. Wesley McKinney.

López Enriquez, M. Pseudo-dacryocystoblennorrhea. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1943, v. 3, Nov.-Dec., pp. 474-475.

In two cases a small sacular fistula opened into the lower canaliculus near the punctum. Pus exuded continuously from the lower punctum and lacrimation was an annoying feature. In each case careful excision of the fistula resulted in complete cure.

J. Wesley McKinney.

Prior Guillem, Antonio. Permeability of the lacrimal canaliculi. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1943, v. 3, Nov.-Dec., pp. 487-488.

In 31 cases of obstruction of one or both lacrimal canaliculi permanent permeability was obtained. A probe insulated except at the tip is passed to the region of the obstruction. A diathermy current of 80 to 100 milliamperes is applied to the probe, and the diathermy current creates an opening through the obstructing cicatrix into the sac. The operation is followed by daily probing for eight to ten days. Permeability was permanent in all cases.

J. Wesley McKinney.

Soria Escudero, M. Unusual prelacrimal congenital malformation. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1943, v. 3, Nov.-Dec., pp. 471-473.

A small sinus of 2-mm. depth over the right lacrimal sac had been present since birth. The sinus was extirpated and found to be lined by skin. No connection with the lacrimal sac could be demonstrated. The condition was evidently due to failure of fetal develop-

ment as to closure of this small segment of the nasolacrimal sulcus.

J. Wesley-McKinney.

Tikhomirov, P. E. Achievement of 25 years in the treatment of diseases of the lacrimal sac. *Viestnik Oft.*, 1942, v. 21, pt. 6, p. 39.

The first work on dacryocystorhinostomy in Russia was done by Averbach, who in 1924 reported on 250 operations. By 1942 the number performed at the Helmholtz Institute was 6,000. There it is being taught to a large number of ophthalmologists, and it is now widely used throughout the Soviet Union. This operation restores to active service soldiers disabled by dacryocystitis, and should be performed by all ophthalmic surgeons and in all teaching institutions in the rear and at the front. Much work has been done on the treatment of epiphora not caused by dacryocystitis. The author has demonstrated that epiphora is more frequently caused by disturbances in the lacrimal punctum and canaliculus than by diseases of the lower portion of the system. The author and Pokhisova have both developed operations for eversion of the lacrimal punctum. Ray K. Daily.

Williams, J. L. D., and Hill, B. G. A simplified external dacryocystorhinostomy. *Brit. Jour. Ophth.*, 1944, v. 28, Aug., pp. 407-410.

A brief account of a technique which was used in six cases of dacryocystitis with stenosis of the nasolacrimal duct. The aperture in the bony nasal wall is made so that it lies directly opposite the medial aspect of the sac fundus. The mucoperiosteum of the nose adjoining the opening is removed, and no attempt is made to form it into a flap. An incision is then made in the medial surface of the lacrimal sac. This flap is hinged posteriorly, and is turned back to lie over the posterior lip of the opening into the nose. A piece of rubber tubing is placed through the nasal opening, projecting into the lacrimal sac for about 3 mm. and anchored at the external naris. Postoperatively, syringing through the lower punctum is carried out once daily, and the rubber tubing is removed after seven days.

The value of pre-operative lipiodol X-ray examination is stressed, as well as correction of any obstruction due to deflection of the septum.

Edna M. Reynolds.

# PAN-AMERICAN NOTES

## MISCELLANEOUS

*II Pan-American Congress of Ophthalmology.* Preparations are being continued for the II Pan-American Congress of Ophthalmology, and it is hoped that the second meeting will be held in November, 1945, in Montevideo, Uruguay. This Congress takes pleasure in announcing the forthcoming visit of its president, Dr. Harry S. Gradle, who is planning a trip to various countries in Latin America. He will give lectures at the ophthalmologic centers in these countries.

*International prize.* The National Society for the Prevention of Blindness of New York offers a prize of \$500.00 for the most valuable original paper adding to the existing knowledge about the diagnosis of early glaucoma or the medical treatment of noncongestive glaucoma. This award will take the place of two separate prizes of \$250 each which had been announced some time ago.

Papers may be presented by any practicing ophthalmologist of the Western Hemisphere and may be written in English, French, German, Italian, Spanish, or Portuguese. Those written in any of the last four languages should be accompanied by a summary in English.

The award will be made by the Society with the guidance of an ophthalmologic committee composed of Drs. John N. Evans, Frank C. Keil, Daniel B. Kirby, Arnold Knapp, John M. McLean, R. Townley Paton, Algernon B. Reese, Bernard Samuels, Kaufman Schlivek, Mark J. Schoenberg, Manuel Uribe Troncoso, David H. Webster.

*Brazil.* The Minister of Education in Rio de Janeiro has appointed Dr. Silvio de Almeida Toledo to give a course in Trachoma in July of this year under the auspices of the National Department of Health. Trachoma is prevalent in Brazil. The State of São Paulo alone gave treatment in the year 1943 to 8,253 patients, distributed among the 54 units, dispensaries, and stations of the Health Department. At the same time it gave away more than a half million tablets of sulfanilamide. The number of eye operations made on these patients was 1,459. Folders and instructions to advise against the contamination of trachoma were distributed to 26,957 persons.

*Guatemala.* The Ophthalmological Clinic of the Casas del Niño was founded last year under the auspices of the Lions' Club of Guatemala. Dr. R. Pacheco-Luna is the Director. The babies are examined on entering, and periodically afterwards.

*Perú.* Eleven of the chief Peruvian institutions and seven of the best organizations of this nature in the United States have joined as sponsors of the Second Regional Institute in Administration and Organization of Hospitals which was held in Lima, Perú, December 3 to 16, 1944, organized by the Interamerican Association of Hospitals under the auspices of the Pan-American Sanitary Bureau.

The program was drawn up by a Consulting Committee presided over by His Excellency Señor Dr. Manuel Prado, President of Perú, and by an Executive Committee under the presidency of Dr. Constantino Carvallo, Minister of Public Health and Social Assistance.

The program for the Lima Institute included a series of conferences, practical lectures, and round-table discussions of the most modern equipment and latest techniques in hospital administration.

## SOCIETIES

*Argentina.* III Argentine Congress of Ophthalmology was scheduled for the middle of the month of October, 1944. It was held at the city of Córdoba and lasted for three days.

The Sociedad de Oftalmología del Litoral has elected the following officers to serve during 1944-45: President, Prof. Dr. Carlos Weskamp; Vice-president, Dr. Luis A. Gallo; General secretary, Dr. Arturo Etchemendigaray; Treasurer, Dr. Rafael García Ocha; Members, Dr. Enrique V. Vertotto, Prof. Adj. Dr. Isaac Cotlier, Dr. Juan Maggi Zavalía, and Dr. Raúl Novick.

The "Ateneo de Extensión Oftalmológica" organized a lecture by Dr. Alberto Urrets Zavalía on June 28, 1944. The title of his paper was "Comments on ocular tuberculosis."

*Brazil.* The Ophthalmological Society of São Paulo, through its president, Prof. Moacyr E. Alvaro, organized a visit of São Paulo oculists to Bello Horizonte in the State of Minas Geraes. This visit took place July 11-13, 1944. On the 11th, a surgical session was held and Dr. Orville Conti performed two dacryocystorhinostomies and an operation for pterygium with Arruga's technique modified by the operator.

A scientific session was held and the following papers presented: Dr. Renato de Toledo, "Anesthesia in ophthalmic surgery"; Dr. Nicolino Rebello Machado, "The visual apparatus in cephalic traumas"; Dr. Orville Conti "Care in the cataract operation (during operation, pre-operative, and postoperative)"; Dr. Laborne Tavares, "Laurence-Moon-Biedl's syndrome"; Dr. Oswaldo Silveira, "Iridocyclitis and in-

fectured varicose ulcer," and Dr. Ennio Coscarelli, "Retrocorneal hyaline membranes." On the 12th, a round table discussion was held on the subject of "Difficult cases."

On the 13th another scientific session was held and the following papers were presented: Prof. Moacyr E. Alvaro and Dr. J. Mendonca de Barros, "File for glaucomatous patients"; Dr. Armando Gallo, "On the prevention of glaucoma"; Dr. Orville Conti, "Modification of Arruga's technique in the operation for pterygium"; Drs. Hilton Rocha and Amelio Bonfili, "Gonioscopy and infantile glaucoma"; Dr. Laborne Tavares, "Cutaneous palpebral horn"; Drs. Hilton Rocha and Santiago Freire, "A new cycloplegic (preliminary report)."

The oculists from São Paulo were also given the opportunity of seeing the new public buildings constructed by the Municipal Government and of inspecting the social work carried out by the authorities.

#### PERSONALS

Dr. Moacyr E. Alvaro, professor of ophthalmology of the Escola Paulista de Medicina, visited the United States in October, 1944, in order to attend the meeting of the American Academy of Ophthalmology and Otolaryngology in Chicago. During his stay in the States, Professor Alvaro was one of the speakers at the October 12th meeting of the Chicago Oph-

thalmological Society. His subject was "Clinical effects of local use of sulfonamides in the eyes," which will be published in this Journal.

Dr. Miguel Medrano, has been appointed professor of ophthalmology of the Faculty of Medical Sciences of the University of Guatemala.

Dr. R. Pacheco-Luna has been elected medical director of the Society for Protection of Children.

Dr. A. G. Arathoon, holder of a Pan-American Congress of Ophthalmology—Kellog Foundation Fellowship, has been appointed ophthalmologist to the Military Hospital.

We regret to announce the death of Dr. Gastão Torres, founding member of the Sociedade de Oftalmologia e Otorrinolaringologia of Rio Grande do Sul, Brazil.

Prof. Silvio Abreu Fialho, of Rio de Janeiro, was recently elected to the Brazilian National Academy of Medicine.

Dr. Eugenio P. Fortin, of Buenos Aires, went to São Paulo, Brazil, in July, 1944, to lecture at the Study Center and the Ophthalmological Society. His subject for the lecture at the latter was "The true capillaries of the retina with comments on the anatomy of the fibers of the macular region.

## NEWS ITEMS

Edited by DR. DONALD J. LYLE  
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News items should reach the editor by the twelfth of the month

#### DEATHS

Dr. Fletcher G. Asbill, Ridge Spring, South Carolina, died November 5, 1944, aged 76 years.

Dr. Thomas D. Brown, Ogdensburg, New York, died October 6, 1944, aged 71 years.

Dr. Harry X. Cline, Marion, Illinois, died October 15, 1944, aged 66 years.

Dr. George S. Dixon, New York, New York, died October 9, 1944, aged 91 years.

Dr. Clark B. Hatch, Newark, Ohio, died October 20, 1944, aged 65 years.

Dr. Frederick Krauss, Elkins Park, Pennsylvania, died October 9, 1944, aged 73 years.

Dr. John W. Moore, Gloversville, New York, died October 6, 1944, aged 66 years.

Dr. Leonard G. Redding, Scranton, Pennsylvania, died October 5, 1944, aged 59 years.

Dr. Wayne L. Snyder, Brookville, Pennsyl-

vania, died September 23, 1944, aged 63 years.

Dr. Green B. Taylor, Cameron, Texas, died September 2, 1944, aged 69 years.

Dr. Hartwell Weaver, Dickson, Tennessee, died September 17, 1944, aged 59 years.

#### MISCELLANEOUS

According to a recent announcement, Emory University will sponsor an ophthalmologic Seminar, from April 19th to April 21st, honoring the memory of Dr. Abner Wellborn Calhoun, M.D., L.L.D., who was born April 16, 1845. He was the first professor of ophthalmology of Emory University and a pioneer in Southern ophthalmology. All those interested in ophthalmology are invited to attend as guests of Emory University.

The guest speakers on the program will be Dr. W. L. Benedict, Dr. John Dunnington, Dr.

Harry S. Gradle, Dr. Parker Heath, Dr. Walter I. Lillie, Col. Derrick Vail, and Dr. Frank Walsh.

The fifth semi-annual refresher course in laryngology, rhinology, and otology will be conducted by the University of Illinois, College of Medicine, at the College in Chicago, March 26th to 31st inclusive. As the registration is limited to 30, applications will be considered in the order in which they are received. The fee is \$50.00. When writing for application please give details concerning school and year of graduation, and past training and experience. Write to Dr. A. R. Hollender, chairman, Refresher Course Committee, Department of Otolaryngology, University of Illinois, College of Medicine, 1853 West Polk Street, Chicago 12, Illinois.

The Toledo Hospital Institute of Medical Research has been given a grant of \$6,500 a year for a two-year period by the Synder Ophthalmic Foundation for research on the physiology of the eye especially in relation to glaucoma. Because of the war, research will be delayed until a physiologist with specialized training in the eye is available.

The first Gifford Memorial Lecture was given at 7:30 p.m. on Monday, January 15, 1945, at the Continental Hotel (formerly the Medinah Club), 505 North Michigan Avenue, Chicago, Illinois. The speaker was Dr. Francis Heed Adler, of Philadelphia, who delivered a paper on "The pathologic physiology of convergent strabismus."

#### SOCIETIES

The Washington, D.C., Ophthalmological Society held its regular meeting on January 8, 1945, at the District of Columbia Medical Society Building. The guest speaker was Dr. Ralph I. Lloyd of Brooklyn who presented a paper on "Proptosis." A motion picture on "Extraction of magnetic and nonmagnetic foreign

bodies" was given by Dr. Arno E. Town. The following cases were presented: "Perivascularitis" by Dr. Sterling Bockoven; "Pulsating exophthalmos" by Dr. Ronald A. Cox; "A detachment of the retina" by Dr. Paul Levatin; "Unilateral trachoma—questionable" by Dr. Roy A. Stewart; and "Disciform degeneration of the macula" by Dr. Richard Wilkinson.

The 824th meeting of the Milwaukee Academy of Medicine was held jointly with the Milwaukee Oto-Ophthalmic Society on Tuesday, December 19, 1944.

At the December meeting of the Brooklyn Ophthalmological Society Dr. James W. White spoke on "Choice of the fixating eye" and Dr. Rudolf Aebli discussed "The relationship between ptosis and ocular-muscle anomalies."

#### PERSONALS

On December 14, 1944, at the New York Eye and Ear Infirmary, E. M. Burchell, D.Sc., was honored by that institution in recognition of the 50 years of service he has rendered it. Honorary membership in the American Academy of Ophthalmology and Otolaryngology was conferred by Dr. William L. Benedict. Since the event has been reported in various news magazines, the Journal will content itself with joining with the medical and scientific world in wishing Dr. Burchell joy of his well-deserved honors.

Dr. Henry Haden was the guest of the St. Louis Ophthalmic Society on the evening of January 26, 1945. After a dinner given by the Society in his honor, Dr. Haden presented a classical paper on the comparative development of the retina and the brain in human embryos up to 40 mm. The similarity in the structure of the two organs as they develop was beautifully illustrated. It is hoped that this paper can be presented to the readers of the Journal during the coming year.

# AMERICAN JOURNAL OF OPHTHALMOLOGY

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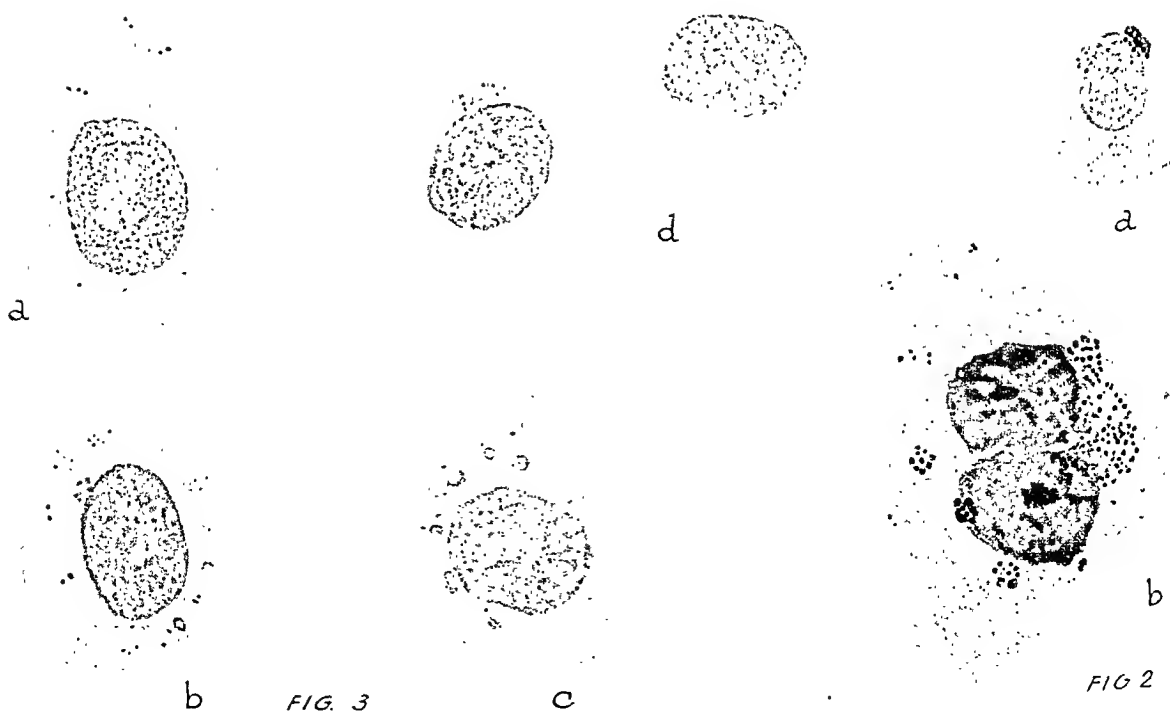
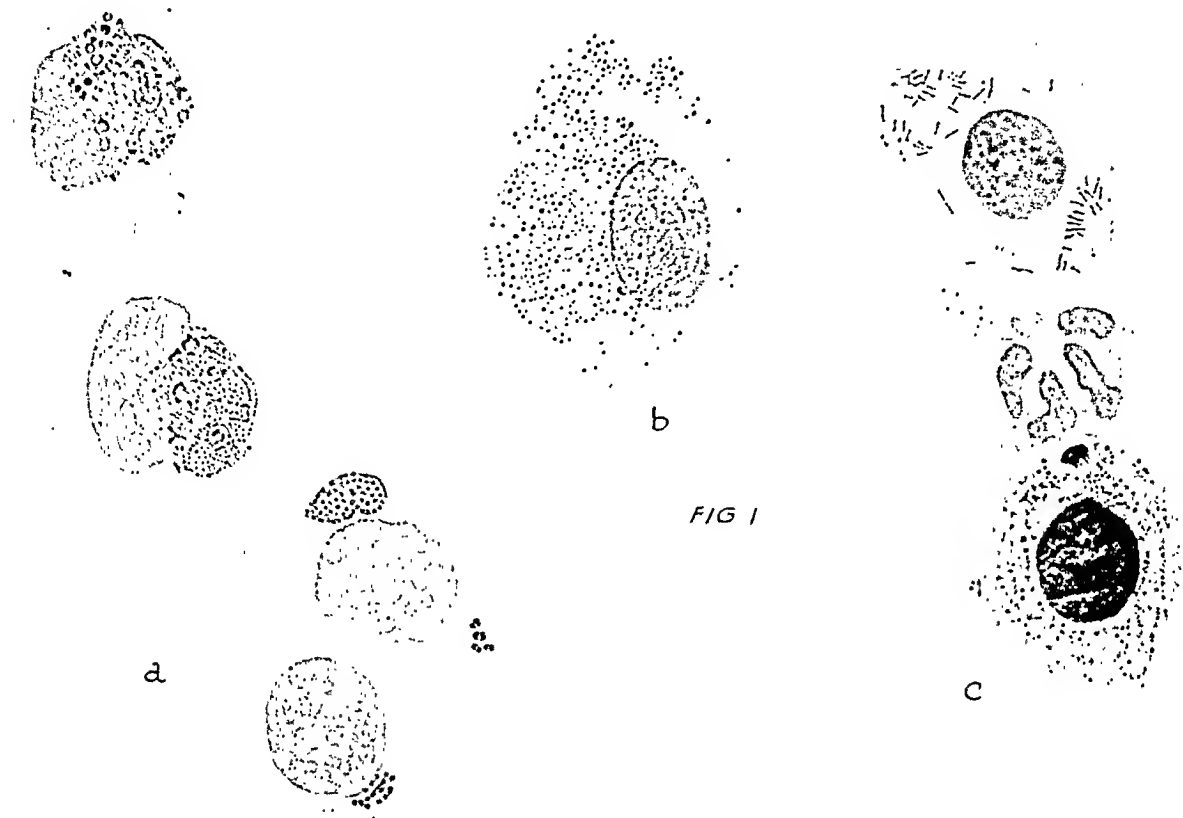
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## ARIBOFLAVINOSIS

IDA MANN

Oxford, England

Ariboflavinosis is rare in England and much confusion still exists concerning its ocular signs. A good deal of clarification is required before one can reconcile such discrepancies in the literature as those between Tisdall *et al.*, who found ocular signs of it in 197 of 198 R.A.F. personnel examined (99.5 percent), Gregory, who only found 31 cases in 1,059 patients (3 percent), Wellwood Ferguson, who found 17 among 250 outpatients (6.8 percent), and Scarborough, who found 70 among 204 patients (34.3 percent).

These discrepancies tend to sort themselves into two groups with a high and a low incidence, respectively, and would seem to depend on whether the observers were ophthalmologists (and therefore conversant with the appearance of the limbus under different conditions and with different kinds of corneal vascularization) or not. Bessey and Wolbach, who showed that the ocular signs of ariboflavinosis could be produced experi-

mentally in rats, pointed out that the earliest detectable sign is corneal vascularization. In spite of this, subsequent observers have extended this statement to include congestion or engorgement of the normal limbal loops as well as what is clearly shown in Bessey and Wolbach's illustrations to be the formation of new vessels on the cornea itself. As ably pointed out by Gregory in 1943, there is often no discrimination in the literature [for example, Sydenstricker *et al.* (1940), and Kruse *et al.* (1940)] between circumcorneal injection and ciliary congestion, and between a full limbus and an actual invasion of the cornea by new vessels. In Sydenstricker's paper reference is made to a "marked congestion and proliferation of the limbic plexus," but no evidence is given for real proliferation as against the filling up of preëxisting but empty vessels. The former is a condition of great rarity, the latter is extremely common under a host of ordinary conditions, as pointed

←

## Plate 2 (Loewenstein).

Fig. 1. a, Four epithelial cells from the fornix of an eye, trachomatous for many years, with a fresh gonorrheal infection; four intracellular gonococci in the third cell. b, Mature inclusion bodies with escaping elementary bodies. c, Koch-Weeks conjunctivitis with pseudo-inclusion body. Giemsa staining,  $\times 1350$ .

Fig. 2. a, Double infection of one epithelial cell with different stage of development of the inclusion body. b, Elementary and initial bodies in the plasma and many inclusion bodies of different stages. Giemsa staining,  $\times 1350$ .

Fig. 3. a, b, c, are scrapings from the sixth day; d, was taken on the fifteenth day. a, shows elementary bodies only, whereas they are mixed with initial bodies in b and c. The first typical but relatively pale inclusion bodies were found on the fifteenth day (d). Elementary bodies at the borderline of microscopic visibility. Giemsa staining,  $\times 1350$ .

out by Gregory. Indeed, it may sometimes (from irritative causes quite unrelated to ariboflavinosis) assume striking and peculiar vascular patterns, such as the concentric collateral vessels described by Vail and Ascher (1943). These may come and go in the same individual as the irritation varies, but even when they are not easily visible the empty vessels can always be seen with a slit-lamp.

It would therefore seem unwise to include the full limbus among the signs of riboflavine deficiency, the earliest certain sign of which should be taken to be a budding out of new capillaries from the limbal loops at their apices, with extension on to the true cornea. This should be present in both eyes and around the whole corneal circumference, although it may vary in depth in the two eyes. Even then, the final certainty must be the emptying of the new loops after administration of riboflavine.

Undoubted cases of riboflavine deficiency have not often been described in detail, so that the following case, which was more severe than those described by Gregory and Wellwood Ferguson, may be of interest. I am indebted to Mr. A. C. Houlton, who first saw the patient and suggested the diagnosis, for the opportunity of following it up.

#### CASE REPORT

J. H., aged 49 years, a bricklayer, first attended the Oxford Eye Hospital on December 1, 1943, complaining of red and sore eyes, tenderness over the left eye, which was extremely painful, and a dull ache in the right eye, which was also red.

On examination, the patient was seen to be a tall, well-developed, intelligent man; he looked pale and unwell. His eyes

were screwed up, red, and slightly lacrimating. The skin at the corners of his mouth was dry and slightly scaly, but not cracked. There was ulceration of the lower gum. The patient was edentulous, wearing a denture. He also complained of slight facial neuralgia. His tongue was clean and red but showed no fissures.

On examining the eyes, visual acuity was found to be 6/6 right and 6/9, part, left. The right eye showed severe conjunctival injection, the main vessels being intensely engorged. The limbal plexus was full. There were no new *conjunctival* vessels. The cornea showed marginal vascularization and opacities in the substantia propria. The vascularization was distinctive. It was in the form of parallel, radially arranged loops springing from the apices of the loops of the limbal plexus and extending in three arcades beyond this, slightly more than half way to the pupil margin. The vessels were so engorged with blood that they appeared to stand out from the surface. They could not be confused with the vessels of an engorged limbus, as the loops were longer and obviously of new formation, extending over clear cornea. They were not like the fine vessels of a trachomatous pannus, nor the brushlike vessels of interstitial keratitis. They were mostly subepithelial, but in the region of the opacities had penetrated the substantia propria to about a sixth of its thickness. They extended all round the circumference of the cornea. The opacities were subepithelial, grayish, about the same depth, or slightly deeper than the vessels, and were curved concentrically with, but farther out than, the pupillary margin. They were coarse, whitish patches in which the corneal lamellae were disturbed and split apart. In the right eye there was one definite one from the 5- to the 8-o'clock position and other faint, doubtful ones.

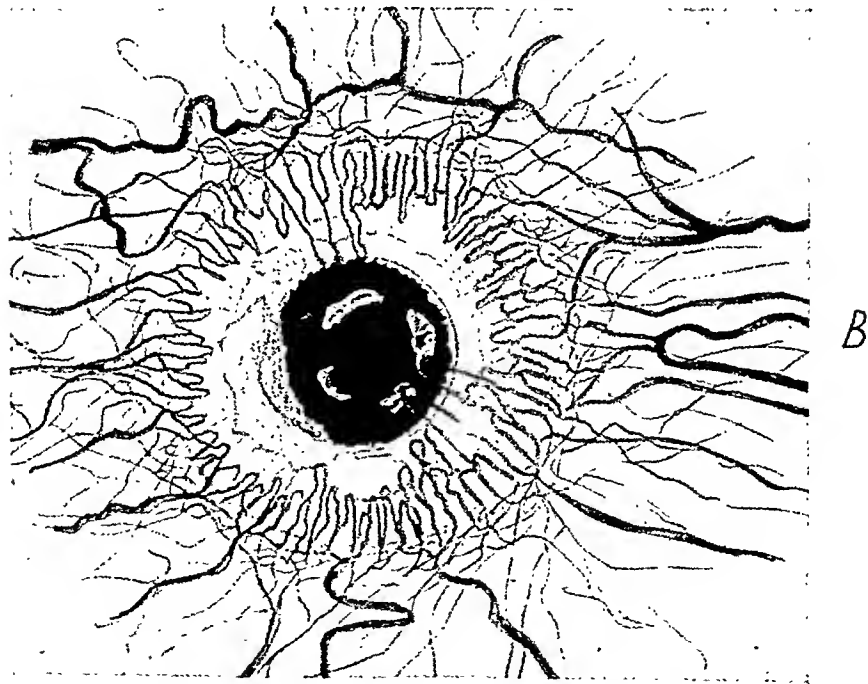
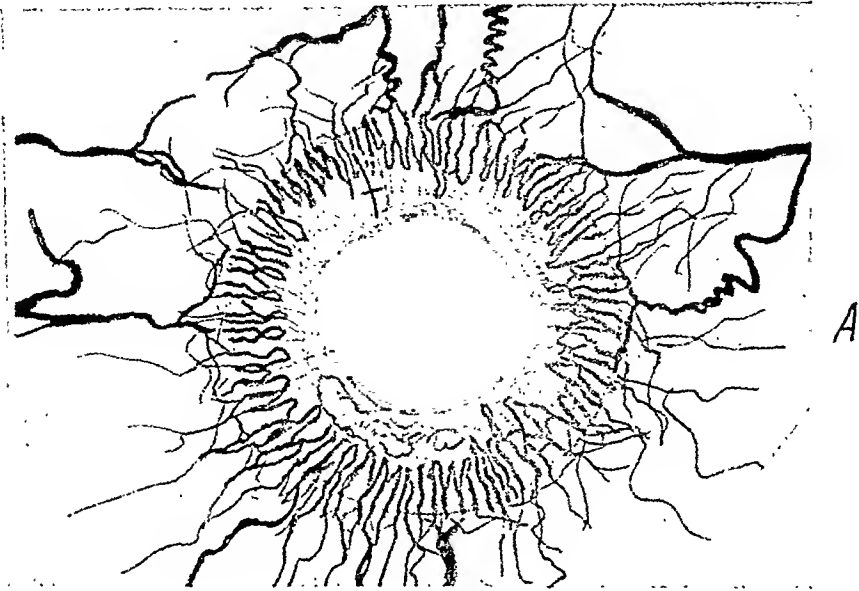


FIG. 1 (MANN). THE RIGHT (A) AND LEFT (B) EYES AT THE BEGINNING OF TREATMENT.

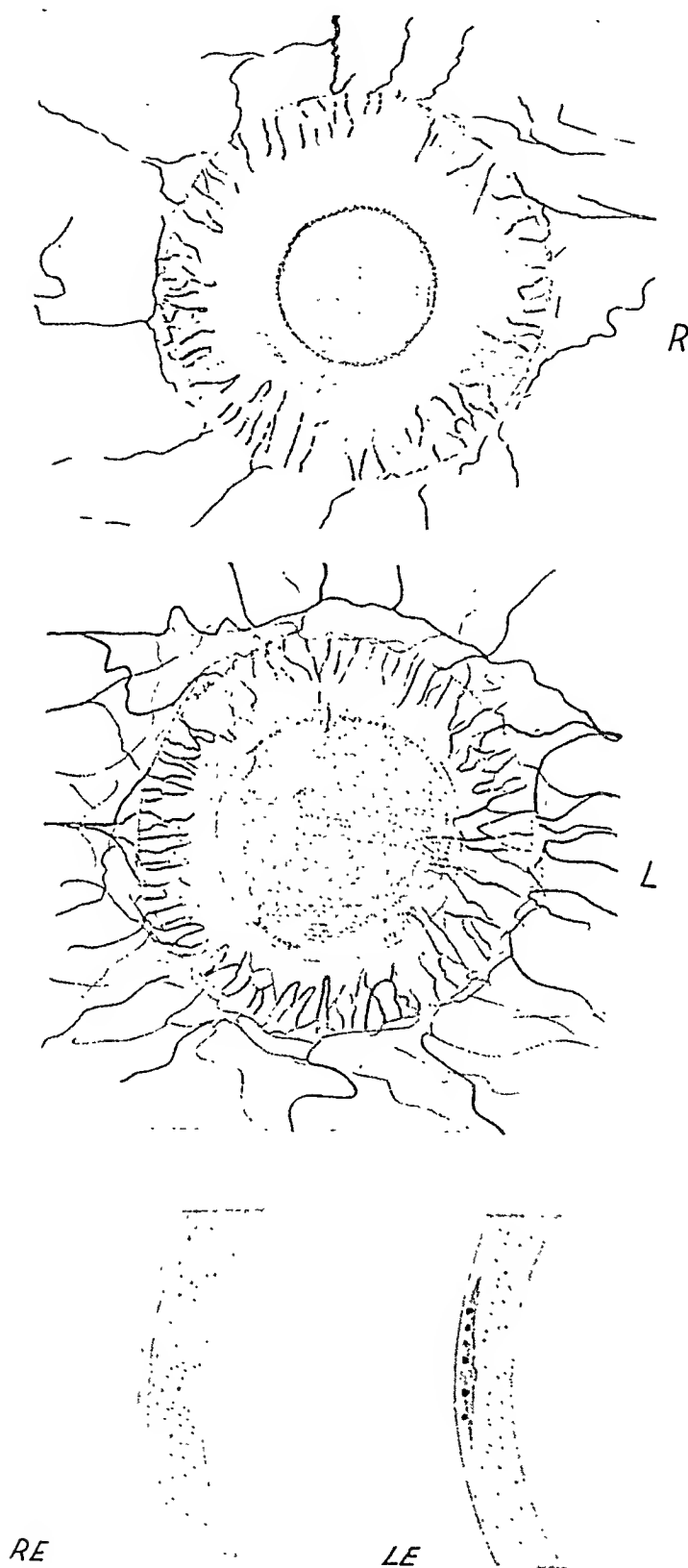


FIG. 2 (MANN). AFTER 10 DAYS' TREATMENT. SLITLAMP APPEARANCES IN REGION OF OPACITIES SHOWN BELOW.

The fundus was normal and the center of the cornea clear.

In the left eye the condition was similar, but much worse. The patient stated that he had had a small corneal ulcer in this eye five years previously, and this may account for the greater severity, as the old scar may have broken down. In this eye there were two concentric rings of opacities, one outside, the other inside the pupillary margin. The rings were not complete, but were broken up into seven or eight separate, somewhat kidney-shaped opacities. One of these showed some loss of substance and could be described as an ulcer, the others were sub-epithelial. The center of the cornea was clear, and vision remarkably little interfered with, in view of the severity of the condition. The iris was normal in both eyes (see figure 1).

The patient's condition was diagnosed as a case of ariboflavinosis ( $B_2$  deficiency) and he was sent to the Oxford Nutrition Survey for testing. The report showed:

Blood riboflavine—17  $\mu\text{g.}/100$  ml. plasma (low)  
 Dark adaptation—6° 1.94 log. m $\mu\text{l.}$  (poor)  
 Blood vitamin A—75 i.u./100 ml. plasma (normal)  
 Blood carotene—99 i.u./100 ml. plasma (normal)

The poor dark adaptation with a normal blood vitamin-A and carotene content is interesting, in view of Pock-Steen's assertion that "twilight blindness" is an early sign.

The patient was then closely questioned about his habits and diet. He stated that he was engaged in building a hospital, that he lived in a camp with 600 men and had all his meals at a Y.M.C.A. canteen. He did not draw his rations. The nearest inns and shops were three miles away and he did not supplement the canteen food, which was roughly as follows:

7:30 a.m. Breakfast:  
 porridge occasionally  
 bread (often sour)  
 practically no margarine  
 no butter  
 ham, spam, or bacon  
 1 egg in six weeks  
 10:30 a.m. Lunch:  
 Tea and bread and cheese. or bread and jam  
 sometimes margarine  
 12:30 p.m. Dinner:  
 once a week meat and two vegetables otherwise ham, spam, minced meat  
 potatoes (boiled) and beans  
 occasionally fish or sausages  
 had carrots twice in six weeks, turnips and onions occasionally  
 semolina pudding or pie (jam)  
 apple pie once in six weeks  
 4:00 p.m. Tea:  
 tea with dried (skim) milk  
 bread, cheese occasionally, otherwise jam  
 6:30 p.m. Supper:  
 "finished up whatever there had been for dinner"; pickles added, and sometimes ham

No fruit. Green vegetables once a week. Beer once a fortnight, by walking three miles. Tobacco plentiful. The food was cooked a long time before he got it.

The patient began work under these conditions on October 15th. He had previously lived in his own cottage, where he cultivated three quarters of an acre and ate home-grown vegetables. After a little while at the camp he noticed that he often felt very hungry, though the quantity of food was adequate. He did not think the cooking was good, or the food always fresh.

After being examined on December 1st, he was sent back to the camp, told to continue with the food, but to take 15 mg. of riboflavine a day. He returned to Hospital on December 8th, stating that he felt much better in himself, but his left eye was very painful. The visual acuity of the right eye had improved to 6/5 part, but the left was only 6/18, probably due to the corneal ulcer. The ocular condition was about the same, and he was admitted to the Hospital, given atropine



to the left eye, riboflavine, as before, and the ordinary hospital diet:

Breakfast:

Bacon and potatoes  
or porridge and potatoe cakes  
or scrambled egg  
Tea with milk

Lunch:

Cocoa made with milk, and biscuits

Dinner:

Irish stew and vegetables  
Milk pudding

or

Roast mutton and 2 vegetables (potatoes and greens or carrots, etc.)

Pastry

or

Fish and 2 vegetables  
Chocolate pudding

or

Meat pasty and 2 vegetables  
Apple fritters and milk pudding

Tea:

Bread and butter (and jam)  
or sandwiches

Supper:

Fish pie  
Blancmange

or

Soup; bean pie  
Milk pudding

or

Macaroni cheese  
Milk pudding

or

Liver and bacon  
Milk pudding

Within four days the congestion of the new vessels in the right eye was reduced to half and the left was improving. On December 21st he was discharged, feeling quite well. The right eye looked normal to ordinary inspection, but with the slit-lamp all the vessels could still be seen, although most of them were empty, with an occasional spurt of corpuscles. The opacity was still visible, but was less. There were no subjective symptoms.

The left eye was still under atropine, and there was slight photophobia. It was still redder than the right. The vessels were emptying and the opacities clearing (fig. 2). The pain and tenderness had all disappeared. Visual acuity had improved

to 6/9. The ulcer in the mouth had healed, the skin of the angles of the mouth was normal, and the patient felt quite well.

The patient was finally seen on April 26th. He had left the camp and was living at home, having no treatment and feeling very well. Visual acuity in the right eye was 6/5 and in the left 6/6 with correction (right emmetropic, left  $-2.50D.$  sph.  $\ominus -0.50D.$  cyl. ax.  $90^\circ$ ).

The new vessels in the right eye were all completely emptied, but were just visible by retroillumination with the slit-lamp. The corneal opacity seen in figures 1 and 2 was still evident. It was narrower and showed a brown pigmentation similar to that of a Hudson's line. This was just subepithelial, and the anterior third of the substantia propria was seen to be involved in the opacity. The left eye also was quite clear, although the ring of opacities was still present. A few of the vessels still conveyed circulating blood. The majority were empty. The opacities in the cornea appeared more fluffy and less dense than previously. The epithelium was intact, and the anterior segment of the eye apart from the cornea quite normal.

There are many points of interest in this case. The new formation of corneal vessels round the whole circumference in both eyes in undoubted and very characteristic. The concentric arrangement of the opacities just beyond the tips of the new vessels has not been specially noted before. Sydenstricker gives no details and Wellwood Ferguson states that he has not seen opacities in any of his English cases. The fact that the old ulcer broke down in the left eye may account for the greater pain in this eye, the other opacities in both being subepithelial. The passage of the vessels more deeply into the substantia propria in the neighborhood

of the opacities has not been described before, neither has the slitlamp appearance of splitting of the corneal lamellae in the opacities, as far as is known. The rapid emptying of the vessels under riboflavine treatment can probably be considered diagnostic, in spite of the improved diet and one day of Multivite tablets while in Hospital. It will be seen that the condition when well marked is very characteristic. It could not easily be diagnosed as anything else, certainly not

as either rosacea keratitis or interstitial keratitis. The cure was quite dramatic, the eye which received no local treatment doing as well, or better, than that which had atropine.

#### SUMMARY

A case of ariboflavinosis is described, with details of new vessels and type of corneal opacity.

*The Eye Hospital.*

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# THE SPACE EIKONOMETER TEST FOR ANISEIKONIA\*

ADELBERT AMES, JR.<sup>†</sup>

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It is universally recognized that the position of objects in the field of view can be more accurately estimated by binocular vision than by unocular vision. In any activity wherein accurate knowledge of the position of objects in the field of view is important, it is recognized that excellent binocular vision is necessary.

Various tests and procedures have been devised to determine the degree of excellence of binocular stereoscopic vision. These have all taken the form of determinations of the accuracy with which an observer can judge the distances between closely juxtaposed test objects (the actual positions of which are known where actual objects are used, or their disparity where stereoscopic cards are used).

Such tests are based on the assumption that binocular vision provides a basis only for a more accurate judgment of the relative distance between objects; that is, of relative depth. These tests usually are restricted to the central or axial field of view. Recent investigations, however, have shown that this is too limited a concept of the spatial clues provided by binocular vision; that, in fact, binocular vision not only provides a basis for estimating the relative distance between axial objects, but also for accurately estimating the position of objects relative to the observer and relative to each other. This

more extended capacity might be called "binocular spatial localization."

While the aforementioned so-called "depth perception" tests disclose whether or not the two eyes are being used together in binocular stereoscopic vision and the accuracy of the relative "depth perception" with respect to two juxtaposed objects, they do not give any indication of the normalcy or abnormalcy of the observer's "spatial localization"; that is, whether or not the observer sees objects to be situated where they actually are. An observer can have very accurate relative "depth perception" for juxtaposed objects and yet localize objects incorrectly relative to himself and relative to each other.

The correctness of a subject's binocular spatial localization is determined by the nature and amount of the anomalous incongruity between the ocular images received from the two eyes. Normal binocular spatial localization is based on a normal incongruity of the ocular images due to the separation of the two eyes. Where the incongruity of the ocular images differs from the normal, anomalous spatial localization will result.

Early in the research in aniseikonia, it was recognized that differences in the size and shape of the ocular images from the two eyes have an important relationship with binocular (stereoscopic) spatial localization. Objects may appear to be at different relative distances from each other and from the observer than they actually are, their shapes and sizes may appear to be altered, surfaces may appear to be tilted or inclined in directions different from what they actually are. This spatial localization is a phenomenon of

---

\*From the Research Division of the Dartmouth Eye Institute.

<sup>†</sup>The author wishes to express his indebtedness to Prof. K. N. Ogle for invaluable assistance in the development of the space eikonometer, and to Prof. R. J. Beitel, Jr., for the preparation and presentation of the material contained in this manuscript.

stereoscopic vision; it takes place over the entire binocular visual field and is not restricted to discrimination of differences in depth only in the central field of vision. The basic facts concerning the relationship between anomalous binocular spatial localization and the differences in size and shape of the ocular images were brought out first in the early studies on the horopter<sup>1</sup> and later on the "tilting boards"<sup>2</sup> and "leaf room."<sup>3</sup> These experiments have shown that individuals with normal eyes are very sensitive to changes in the relative size and shape of the ocular images. They can discriminate changes in binocular localization resulting from the introduction of size differences of as little as 0.125 percent to 0.25 percent between the images in the two eyes. Both the apparent changes in localization and the accuracy of discrimination approach the theoretic maximal limits to be expected, the freer the field of view is from unocular clues to localization, such as perspective from rectilinear detail and from known forms. Where such clues are present, as in the average room, the spatial distortions may not even be apparent. It must not be concluded from this that the incongruity of the ocular images—that is, the aniseikonia—is in some way compensated for. Rather, the observer is relying predominantly upon the unocular clues here and is not responding to the binocular stereoscopic clues (disparities between the two ocular images) for localization.<sup>4</sup>

The immediate and significant conclusion to be drawn from such results is that one's ability to localize objects accurately—that is, to see things *where* they actually are—can be markedly impaired by aniseikonia. Since it is *where* we see things that primarily determines our motor innervations and muscular responses, both bodily and ocular, it at once becomes clear how

aniseikonia can make it impossible for us to function efficiently or successfully. It is reasonable to believe, for instance, that the symptoms reported by aniseikonic patients may be traced to the frustrations attending the conflicting activities resulting from false localization.

With this in mind it was decided to explore the possibilities for developing a test means whereby the nature and amount of aniseikonia could be determined from the way in which an observer might localize certain test elements in space. The problem in design was to obtain a test field or environment the elements of which could be used, alone or in combination, to differentiate and measure each of the various types of aniseikonia. In instruments for determining binocular spatial responses, it is necessary to eliminate all empirical or unocular clues which would tend to interfere with the "pure" *binocular* (stereoscopic) space perception; that is, the space perception derived solely from disparities of the images in the two eyes. The simplest possible nonconflicting types of contours are necessary, adequately screened from other objects and influences that might yield spatial clues. A satisfactory method was achieved with the development of the "space eikonometer."

It will be the purpose of this paper (1) to describe the space eikonometer, (2) to describe the various types of aniseikonia and their effect on localization of the test elements, and (3) to describe the technique for measuring the amount of aniseikonia by means of the space eikonometer test.

#### THE SPACE EIKONOMETER

The space eikonometer will be described in two parts: (a) the test elements of the target, and (b) the test lens unit before the observer's eyes. See figure 1.

## THE TEST ELEMENTS OF THE TARGET

The essential test elements of the space eikonometer target are:

- (1) Four smooth vertical plumb lines or cords;
- (2) A cross (or X) consisting of two smooth cords at right angles to each other and at 45 degrees to the vertical lines;
- (3) A removable vertical plumb line which passes through the center of the cross.

For easy identification, the smooth

This smooth cord, which is colored white, can be raised or lowered from the side of the frame.

Two vertical plumbs are suspended both in front of and behind the cross at distances of 24 inches. These cords are separated 19 inches, equidistant from the objective, median plane of the observer and also at right angles to that plane. The visual angle subtended by these cords is approximately 11 degrees. The smooth cords in front are colored green; those behind, white.

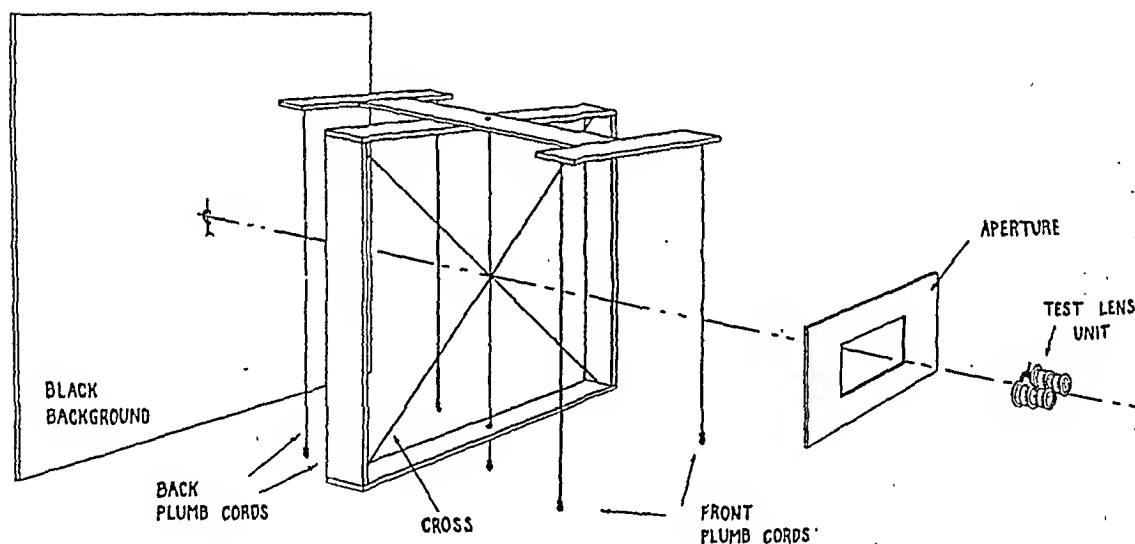


Fig. 1 (Ames). Schematic drawing of space eikonometer.

cords of the various test elements are colored differently.

The cross, stretched within a frame 5 feet square, is set up at a distance of 10 feet from a headrest for the observer. The center of the cross is at the height of the observer's eyes (49 inches—average height of eyes of seated person) above the floor. The plane of the cross is carefully mounted at right angles to the floor and to the objective median plane of the observer. The cords of the cross are colored red. A hole is bored in the top of the frame so that a cord with a plumb bob that passes through the center of the cross can be lowered, when desired.

In order that the test elements shall be as free as possible from empirical clues, the cords used are quite small. Theoretically, the thinner they are, the better. Further, the illumination of the test elements must be bright and uniform, without shadow.

For a background, a black cloth is stretched over a frame at a distance of at least 5 feet behind the back plumb lines. This background must be free of detail, such as wrinkles, shadows, or lint, that can be seen by both eyes. In front of the observer is an aperture which restricts the binocular visual field strictly to the test elements. Neither the tops and bottoms

of the test elements nor the frame of the cross is to be visible through that aperture.

#### THE TEST LENS UNIT

Situated before the observer's eyes is a battery of lenses which is used to measure the amount of magnification necessary to correct the anomalous spatial localization and, from this, the type and degree of the ocular-image incongruities (aniseikonia). If one of the test elements of the target appears incorrectly located, the appropriate change is made in the battery until the test element in question appears correctly located. The change in the lenses measures the magnitude of the anomalous-image incongruity.

The battery of lenses is contained in a phorometer-type mount and consists essentially of four units before each eye.\* These units will be described according to the sequence of their position before each eye. See figure 2.

(a) Nearest each eye is an adjustable size unit for changing the image size in the horizontal meridian only (axis  $90^\circ$ ). The adjustable size unit consists of a telescopelike system of two lens elements, designed in such a way that a change in axial position of one lens relative to the other changes the magnifying effect of the combination without appreciably changing its (zero) verging power. The scale on the circumference of the unit is calibrated to give the percent magnifying power of the unit corresponding to the different separations of the lens components.<sup>3</sup>

(b) Next is a similar adjustable size unit, one before each eye, for changing the image size in the vertical meridian only (axis  $180^\circ$ ).

\*The test lens unit described here is the laboratory or experimental model in use at present. Improvements in design are being developed.

(c) Behind these units are four lens cells, two before each eye, for holding individual test size lenses when these are necessary. The cell farthest from the eye in each case can be rotated so as to permit adjustment of the axis of a meridional size lens to any desired meridian.

(d) Finally, there is the front unit for determining whether there is a meridional aniseikonic error at an oblique axis. This

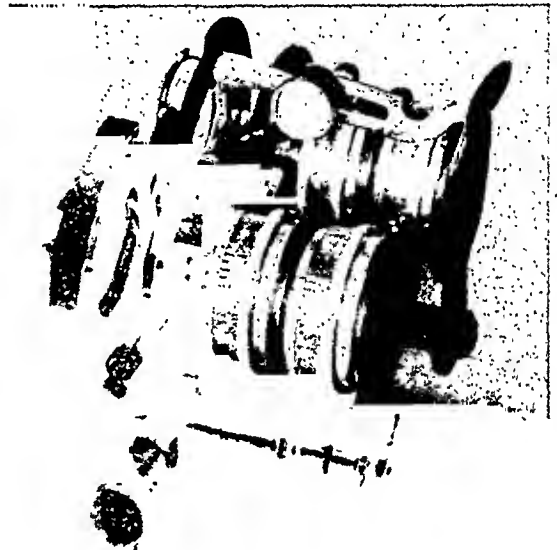


Fig. 2 (Ames). Test lens unit.

consists of two 2.0-percent meridional size lenses, one before each eye, geared so that they rotate together equally but in opposite directions. A handle for rotating the two lenses is attached to the right lens. An indicator and scale engraved in degrees show the rotation of the two lenses from the position where their axes are parallel and vertical. The scale reads only to  $45^\circ$  each way, since the maximum effect occurs at that angle. When the reading is a "positive" angle, the axes of the two lenses will be symmetrically *converged upward*. When the reading is a "negative" angle, the axes of the two lenses will be symmetrically *converged downward*. The angle of rotation is usually designated by  $\rho$  (rho).

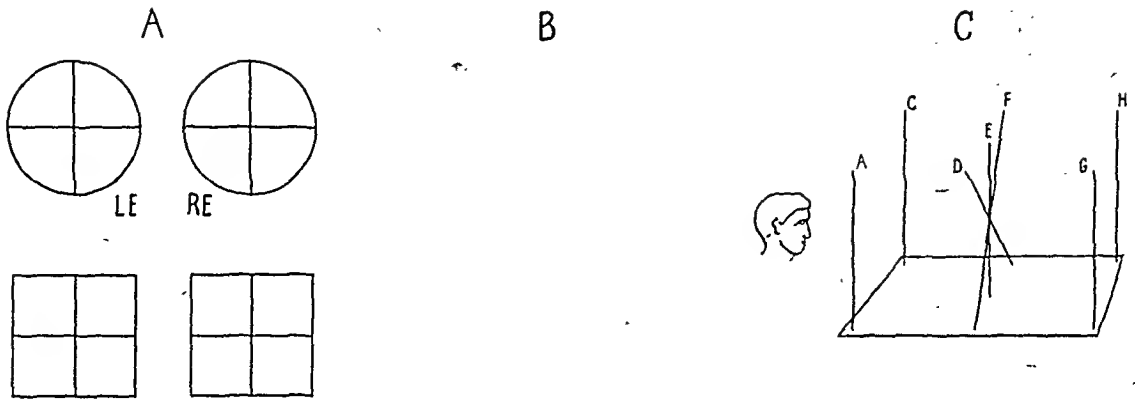


Fig. 3

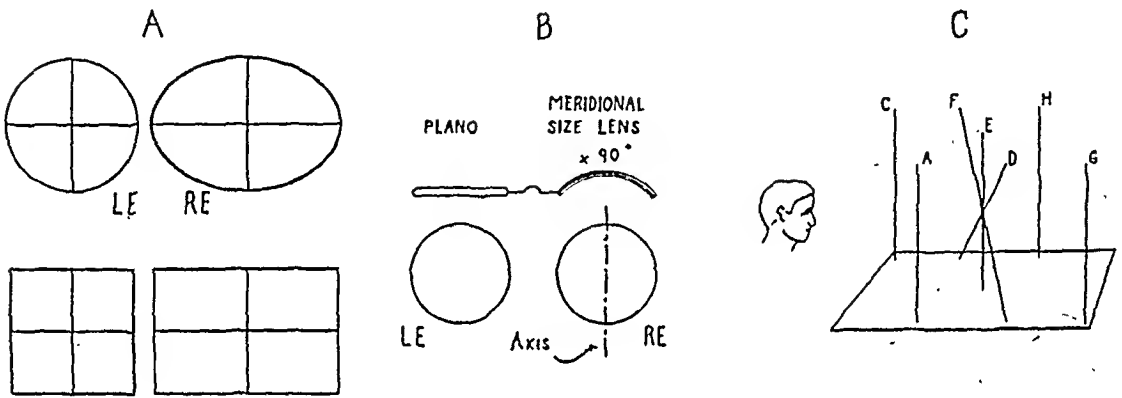


Fig. 4

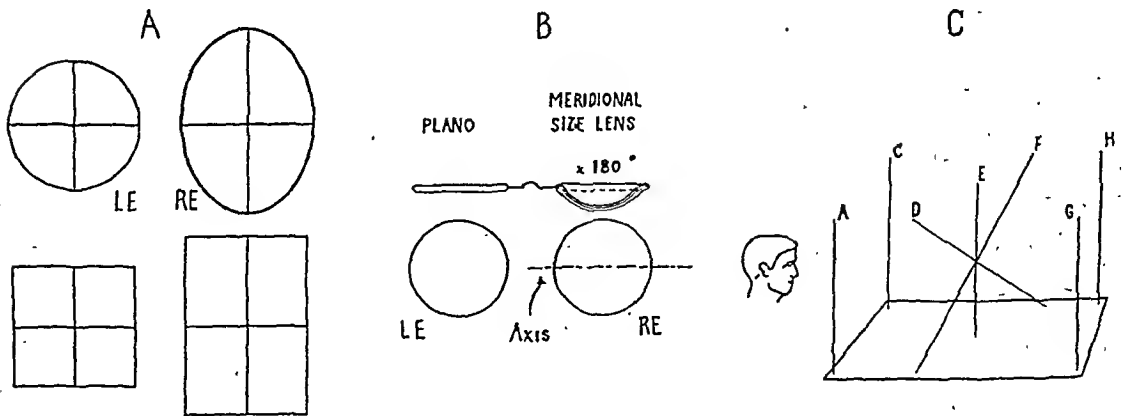


Fig. 5

Figs. 3-5 (Ames). Localization. Fig. 3, Normal localization: normal ocular images. Fig. 4, Anomalous localization: horizontal size difference. Fig. 5 Anomalous localization: vertical size difference.

An interpupillary-distance adjustment screw with scale is provided in the battery mount.

The battery must be kept level. For this

purpose, a small spirit level and adjustment screw are attached to the base of the support.

An adjustable chin cup and forehead

rest are provided for positioning the observer's head.

#### ANISEIKONIA AND ANOMALOUS APPEARANCE OF THE TARGET ELEMENTS

As an aid to understanding the effect of various types of aniseikonia on the spatial localization of the target elements, there follows a series of illustrations, each of which will present diagrammatically the following objects and methods: (a) the particular type of anomalous incongruity, (b) the means (size lenses), for artificially producing such an incongruity, and (c) the appearance of the elements of the target of the space eikonometer where such an ocular incongruity is present.

Figure 3, as a basis for comparison, diagrammatically illustrates the aforementioned conditions where there is no anomalous incongruity of the ocular images. Drawing A diagrammatically shows the ocular images from the two eyes to be of the same size. (Normally, they are not identical due to the separation of the two eyes.) Nothing appears in the space for drawing B because no size lenses are necessary to produce the normal ocular images. Drawing C shows the normal appearance of the elements of the space eikonometer, all of which lie on planes normal to the binocular line of sight (objective median plane of the observer).

Figure 4 diagrammatically illustrates the phenomena associated with anomalous differences in the size of the ocular images in the horizontal meridian (axis  $90^\circ$ ). Drawing A diagrammatically shows the ocular image of the right eye to be larger than that of the left eye in the horizontal meridian. Drawing B shows the types of aniseikonic (size) lenses that artificially produce this type of ocular incongruity (R.E. meridional size lens axis  $90^\circ$  and L.E. plano). Drawing C shows the anomalous appearance of the elements of the target of the space eiko-

nometer. The vertical cords C and H will appear nearer the observer, the cords A and G farther away, and the cross formed by the cords D and F will appear as if rotated about the axis E, with the left side of the cross appearing nearer the observer. The direction of displacement of all the elements will be the same, but the amount of displacement of G and H will be greater than that of D and F which, in turn, is greater than that of A and C.\* The magnitude of the anomalous spatial localization is given by the magnitude of the apparent displacement of the elements. If the left ocular image was larger than the right in the horizontal meridian, the anomalous appearances would be of the same nature but in the opposite direction.

Figure 5 diagrammatically illustrates the phenomena associated with anomalous differences in the size of the ocular images in the vertical meridian (axis  $180^\circ$ ). Drawing A shows the ocular image of the right eye to be larger than that of the left eye in the vertical meridian. Drawing B shows the type of aniseikonic lenses that artificially produce this type of ocular incongruity (R.E. meridional size lens axis  $180^\circ$  and L.E. plano). Drawing C shows the anomalous appearance of the elements of the target. The vertical cords, A, C, G, and H will appear correctly oriented, but the cross will appear as if rotated about the axis E, with the right side of the cross appearing nearer the observer. If the left ocular image was larger than the right in the vertical meridian, the anomalous appearances would be of the same nature but in the opposite direction.

Figure 6 illustrates the phenomena associated with an overall difference in the size of the ocular images. Drawing A

\* This is owing to the fact that, with a given ocular-image incongruity, the apparent displacement of a given configuration increases with distance.



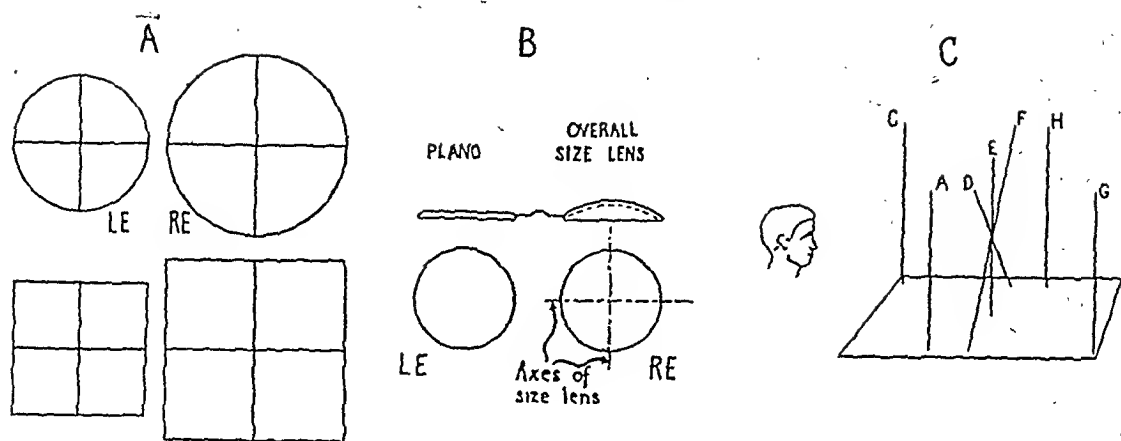


Fig. 6

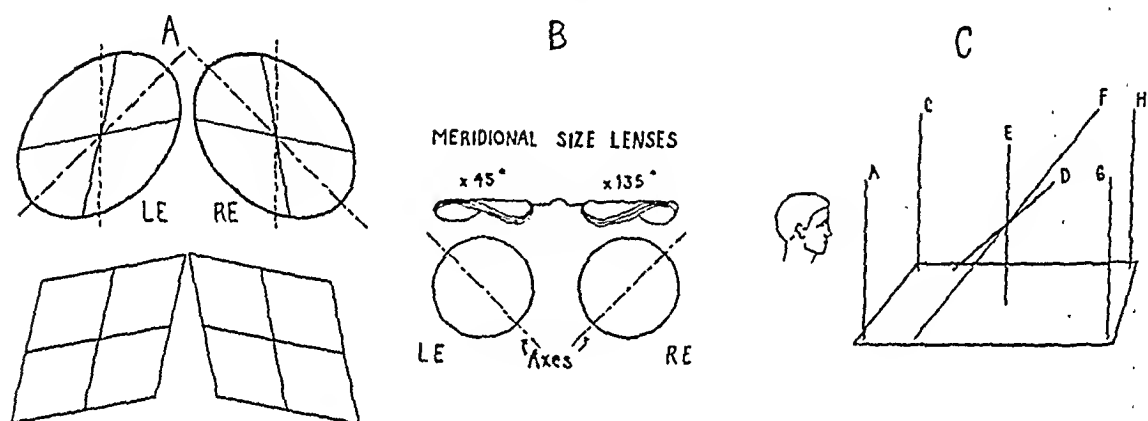


Fig. 7

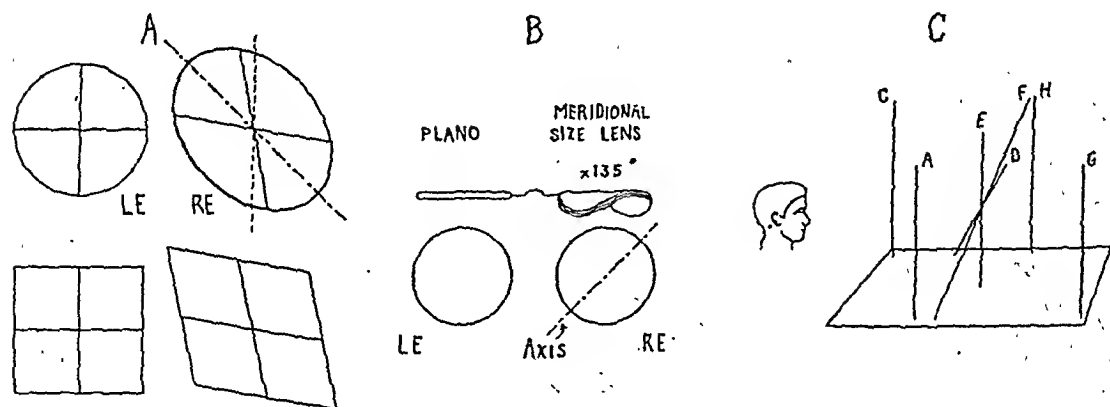


Fig. 8

Figs. 6-8 (Ames). Anomalous localization. Fig. 6, Overall size difference. Fig. 7, Size difference at oblique axes. Fig. 8, Size difference at oblique axis.

shows the ocular image of the right eye to be larger overall than that of the left eye. Drawing B shows the type of aniseikonic lenses that artificially produce this type of ocular incongruity (R.E., over-

all size lens and L.E. plano). Drawing C shows the anomalous appearance of the target elements. The vertical cords C and H will appear nearer the observer and the cords A and G farther away; but

the cross will appear in its actual position. If the left ocular image was larger overall than the right, the anomalous appearances would be of the same nature but in the opposite direction.

Figure 7 illustrates the phenomena associated with differences in the size of the ocular images in oblique meridians. Drawing A shows the ocular images of both eyes when they are increased in oblique meridians. In this case the images of the vertical meridians of both eyes will be rotated inward at the top. Drawing B shows the type of aniseikonic lenses that artificially produce this type of ocular incongruity (R.E. meridional size lens axis  $135^\circ$  and L.E. meridional size lens axis  $45^\circ$ ). Drawing C shows the anomalous appearance of the elements of the target. The vertical cords A, C, G, and H will appear correctly oriented, but the cross will appear tilted away from the observer at the top. If the meridians are rotated in the opposite direction, the cross will appear tilted toward the observer at the top.\*

Figure 8 illustrates the phenomena associated with the condition which results when the ocular image of one eye is increased in an oblique meridian at  $45^\circ$ . Drawing A shows the ocular images when the ocular image of the right eye is increased in an oblique meridian at  $45^\circ$ , which causes the image of the vertical meridian of the right eye to be rotated inward at the top. Drawing B shows the type of aniseikonic lenses that artificially produce this type of ocular incongruity (R.E. meridional size lens axis  $135^\circ$  and L.E. plano). Drawing C shows the anomalous appearance of the elements of the target. The vertical cords C and H

appear nearer the observer and the cords A and G farther away. The cross will not appear to be rotated about a vertical axis but will appear tilted away from the observer at the top. (With this condition, the ocular image of the right eye is slightly greater in the horizontal and vertical meridians, and there is a relative declination of the image of the vertical meridian outward at the top.) If the axis of the meridional error were at  $90^\circ$  to that above described, the cross would appear to tilt forward at the top, but the vertical cords would have the same apparent displacement as shown.

Figure 9 illustrates the phenomena associated with the condition which results when the ocular image of one eye is increased in the oblique meridian at  $30^\circ$ . Drawing A shows the ocular images when the ocular image of the right eye is increased in an oblique meridian at  $30^\circ$ , which causes the image of the vertical meridian of the right eye to be rotated inward at the top. Drawing B shows the type of aniseikonic lenses that artificially produce that type of ocular incongruity (R.E. meridional size lens axis  $120^\circ$  and L.E. plano). Drawing C shows the anomalous appearance of the elements of the target. The vertical cords C and H appear nearer the observer, the cords A and G farther away, and the cross will appear to be rotated in the same direction about a vertical axis E, and will also appear to be tilted away from the observer at the top. With this condition, the ocular image of the right eye is slightly greater in the horizontal meridian, and there is a relative declination of the images of the vertical meridian outward at the top. If the axis of the meridional error were at  $120^\circ$  to that aforesaid, the only difference would be that the cross would appear to be tilted forward at the top. (These particular meridians were chosen for this specific example, but

\* The direction of apparent tilting of the cross caused by meridional size lenses at oblique axes is opposite to that which would result from viewing a plane surface through the same lenses. Explanation of these phenomena will be dealt with in subsequent papers.

the difference may occur in other oblique meridians, in which case variations and combinations of the appearances will occur.)

Figure 10 illustrates the phenomena associated with the condition that results when the ocular image of one eye is increased in an oblique meridian at  $60^\circ$ .

target elements. The vertical cords C and H appear nearer the observer, the cords A and G farther away, and the cross appears to rotate about a vertical axis E, but in an opposite direction to the displacement of the vertical cords, and also appears to be tilted away from the observer at the top. With this condition,

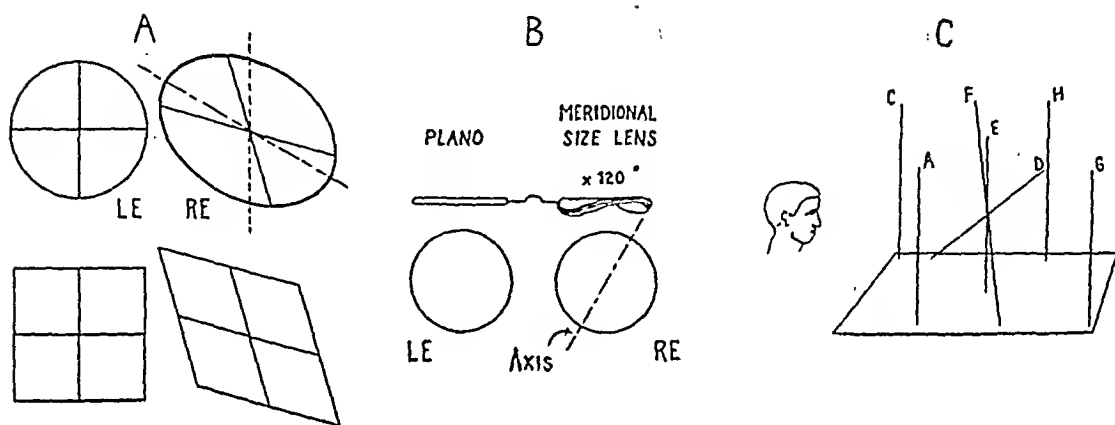


Fig. 9

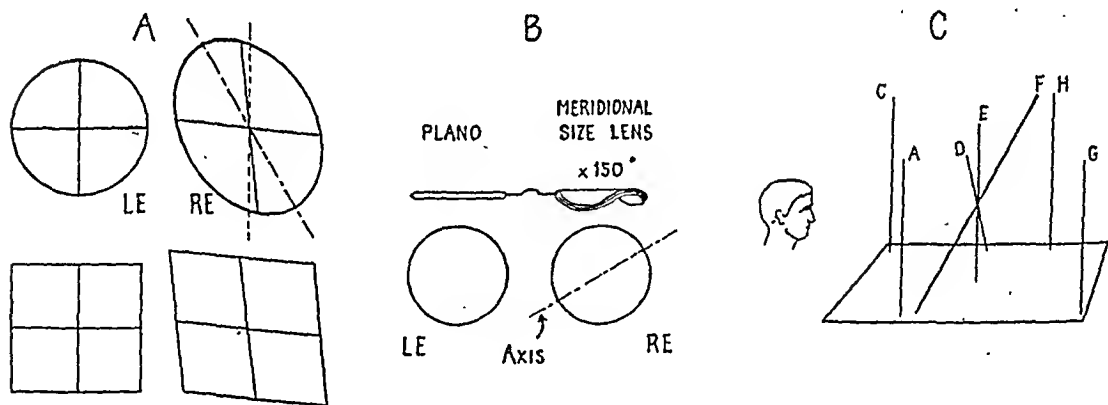


Fig. 10

Figs. 9-10 (Ames). Anomalous localization. Fig. 9, Size difference at oblique axis.  
Fig. 10, Size difference at oblique axis.

Drawing A shows the ocular image of the right eye to be increased in an oblique meridian at  $60^\circ$ , which causes the image of the vertical meridian of the right eye to be rotated inward at the top. Drawing B shows the type of aniseikonic lenses that artificially produce this type of ocular incongruity (R.E. meridional size lens axis  $150^\circ$  and L.E. plano). Drawing C shows the anomalous appearance of the

the ocular image of the right eye is slightly larger in the vertical meridian, and there is a relative declination of the images of the vertical meridian outward at the top. If the axis of the meridional error were at  $60^\circ$  to that aforescribed, the only difference would be that the cross would appear to be tilted forward at the top. (These particular meridians were chosen for this specific example, but the

difference may occur in other oblique meridians, in which case variations and combinations of the appearances will occur.)

Since these diagrams illustrate specifically the principal types of aniseikonia and the spatial effects associated with them, it will be helpful to describe briefly some of the relationships between combinations of these types of aniseikonia and the appearances of the target elements. It should be borne in mind throughout that the magnitudes of the apparent displacements of the elements increase with an increase in the amount of image size difference. Thus, the greater the size difference between the ocular images in the horizontal meridian, the greater the apparent displacement of the front (and the back) vertical cords. Likewise, the greater the vertical size difference, the greater the apparent rotation of the cross about a vertical axis.

If both the cross and the vertical cords appear to be turned about a vertical axis in the same amount, it means that the size of the ocular image of one eye is larger than that of the other in the horizontal meridian.

If the cross appears to be turned to a greater degree than are the vertical cords in the same direction, it means that the size of the ocular image of one eye is larger in the horizontal meridian and that of the other eye is larger in the vertical meridian.

If the cross appears to be turned to a lesser degree in the same direction, it means that the ocular image of one eye is relatively larger in the horizontal meridian and also in the vertical meridian, but to a lesser degree.

If the cross appears to be turned in the opposite direction to the vertical elements, it means that the ocular image of one eye is relatively larger in the vertical meridian and also in the horizontal meridian, but to a lesser degree.

When the cross does not appear to turn and the vertical elements do, it means that the ocular image of one eye is relatively larger overall than that of the other.

If the cross appears to be tilted away from the observer at the top, it means that the axis of the meridional size correction converges upward toward the median plane (forehead) of the observer.

If the cross appears to be tilted toward the observer at the top, it means that the axis of the meridional size correction converges downward toward the median plane (chin) of the observer.

*To summarize*, the nature and relative magnitude of the anomalous spatial localization, which is disclosed from the appearance of the space eikonometer target, is directly related to the type and degree of aniseikonia present.

#### GENERAL PROCEDURE OF THE SPACE EIKONOMETER TEST

With this description of the various types of aniseikonia and their effect on spatial localization, the general nature of the methods used for determining the nature of a subject's ocular incongruity and his anomalous binocular spatial localization will now be considered.

Three types of information can be obtained by means of the space eikonometer with regard to a subject's anomalous spatial localization (aniseikonia):

- (1) The appearance to the subject of the elements of the target of the space eikonometer when the adjustable size units are set at zero; that is, are not introducing magnification (size differences).

- (2) The nature and magnitude of the magnifications that have to be introduced by means of the size lenses to cause the elements of the target to appear in their proper positions.

- (3) The degree of accuracy with which a subject binocularly localizes the various elements of the target, as shown

by the spread of his settings of the adjustable size units when magnifications are introduced to cause the elements of the target to appear in their proper positions.

The general procedure for obtaining this information is as follows:

The subject, wearing his distance refractive correction (if ametropic) in a trial frame or spectacles, is seated before the instrument with his head properly positioned in the headrest. The examiner adjusts the test lens units for interpupillary position and makes certain that the subject can see both of the front green plumb cords with each eye.

It is then explained to the subject that this is a test involving binocular space perception and that the test elements of the instrument will be seen to change their positions during the different parts of the test when certain lenses are used and that he (the subject) will be asked to make accurate judgments as to their relative distances and positions. While the examiner calls attention to the test elements and their behavior, he gradually changes the size of the image of one eye and then that of the other by means of the adjustable size units, first in the horizontal meridian (axis  $90^\circ$  unit), then in the vertical (axis  $180^\circ$  unit), and then in oblique meridians (geared lens unit). This series of changes in image size with the corresponding changes in apparent orientation of the test elements serves both to acquaint the subject with the nature of the test and to arouse his stereoscopic perception. (It is well to bear in mind that aniseikonic patients frequently have binocular fusion difficulties and may be relatively insensitive to stereoscopic clues.)

The adjustable size units are then set at "zero" and the subject is questioned as follows: "Do the two front green cords appear the same distance from you or is

one nearer? If one is nearer, which one—the right or left?" "Does the cross, when considered as a whole, appear rotated about the central white cord, with one side nearer to you than the other, or are the two sides at the same distance from you?" If they are not at the same distance, the subject is instructed to estimate whether the apparent rotation is equal, greater, or opposite in direction to the apparent rotation of the two front green cords. "Does the cross, when considered as a whole, appear to be vertical, or is it inclined with the top toward or away from you?"

The subject's answers to these questions may be entered on the data sheet as a qualitative record of the nature of his anomalous localization.

Using the same form of questioning, the examiner then proceeds to determine the magnitude of the false orientation of the test elements in terms of the image size difference (magnification) which it is necessary to introduce to correct the false orientation. The basic principle to be observed is to measure and correct the size difference in the horizontal meridian (axis  $90^\circ$  unit) before proceeding with the measurement of the vertical size difference.

*Axis  $90^\circ$  measurements (image size differences in the horizontal meridian).* The subject is instructed to report which of the two front vertical cords appears nearer—the right or the left. If the right cord appears nearer, magnification is introduced in the adjustable size unit (axis  $90^\circ$  unit) before the right eye until it is reported that the cords are equidistant. If the left cord is reported to be nearer, the image size in the left eye is increased in the horizontal meridian.

The rule, then, in making axis  $90^\circ$  determinations, is to increase the magnification before the eye corresponding to the nearer cord. The nearer cord will be on

the side of the eye having the smaller ocular image (in the horizontal meridian).

At this point the accuracy, or sensitivity, of the subject's discrimination can be checked by determining how much magnification, more or less, can be introduced before the lines no longer appear equidistant.

For convenience and consistency, all measured image incongruities (axis  $90^\circ$ , axis  $180^\circ$ , and oblique), should be recorded in terms of the magnification of the size lenses which is necessary to correct the false appearances of the test elements. Thus, R. 3.00%  $\pm 0.25\%$  ax.  $90^\circ$  means that a 3.00 percent meridional size lens at axis  $90^\circ$  before the right eye was necessary to make the two front vertical cords appear the same distance from the observer and that the observer could discriminate this difference with a sensitivity of  $\pm 0.25$  percent. Of course, the left ocular image is actually 3.00 percent larger in the horizontal meridian. For comparison with the subject's symptoms and performance, however, it is usually better to think in terms of which of the ocular images is larger or smaller, instead of in terms of the correction.

*Axis  $180^\circ$  measurement (size differences in the vertical meridian).* With the axis  $90^\circ$  size correction in place, the subject is now instructed to report which side of the cross appears nearer to him—the right or the left. If the right side of the cross appears nearer, magnification is introduced in the vertical meridian (axis  $180^\circ$  size unit) before the left eye until both sides of the cross are reported to be equidistant. If the left side of the cross is reported nearer, the magnification must be increased in the axis  $180^\circ$  unit before the right eye.

The rule, then, in making axis  $180^\circ$  measurements is to increase the magnification before the eye corresponding to the

farther side of the cross. The nearer side of the cross will be on the side of the eye having the larger ocular image (in the vertical meridian).

The accuracy of the subject's judgment can be determined in the same manner as described in the preceding section.

The presence of a vertical phoria will frequently change the appearance of the cross in such a way that the two oblique cords do not appear to intersect, one of the cords appearing closer to the subject than the other. In this event it is necessary to correct the vertical phoria by means of prisms before making the measurements.

An overall difference in the size of the ocular images occurs when, in the absence of an oblique error, the axis  $90^\circ$  and axis  $180^\circ$  corrections before one eye are found to be equal.

*Measurements to determine the image size differences in oblique meridians.* With both the horizontal and vertical size differences corrected, the subject is instructed to report whether the top of the cross appears to tilt toward or away from him. If the top is reported to tilt forward, the geared lenses are rotated toward the minus side of the scale (axes converging down) until the cross is reported to be vertical. If the top of the cross is reported to tilt away from the subject, the geared lenses are adjusted to the plus side of the scale (axes converging up) until the cross is reported to be vertical.

The accuracy of the subject's discrimination can be checked by determining the limits in degrees of rotation of the geared lenses within which the cross is reported to be vertical.

At this point the axis  $90^\circ$  and axis  $180^\circ$  findings should be rechecked. This is done to eliminate the possible influence of the apparent position of the cross upon the cords, and vice versa. The subject should then be questioned as to whether

the elements of the target as a whole appear correctly oriented.

Ordinarily for prescription purposes, it is sufficient to designate the correction in terms of the axis  $90^\circ$  and axis  $180^\circ$  findings in percent magnification and the oblique findings in terms of degrees of rotation of the geared lenses. From these data the lens designer can determine the aniseikonic correction.

It is worth while, in the test, to determine the equivalent prescription of meridional size lenses which corrects the axis  $90^\circ$ , axis  $180^\circ$ , and oblique incongruities as determined by the foregoing procedure. For this purpose, a series of tables have been computed.<sup>6</sup> When this equivalent correction is found, the indicated size lenses may be placed before the eyes. The adjustable size units and the geared lenses are then set back to "zero" and the subject is instructed to report on the appearance of the target elements. If the data and equivalent lens combination have been determined correctly, the equivalent lenses should correct the ocular incongruities present, and all of the elements of the target should appear properly oriented.

*Irregular and asymmetric incongruities.* Thus far, only regular, systematic ocular incongruities have been considered. There is evidence, however, that irregular incongruities, which may be due either to anomalous dioptric conditions or an anomalous anatomic organization of the retinal elements, are not uncommon and can exist in combination with one or more types of regular ocular incongruities. For instance, the ocular image from the right eye may be larger than that from the left in the horizontal meridian at one angular distance and smaller at another. The presence of such irregular incongruities does not make itself apparent in the appearance of the elements of the space eikonometer. It may result, however, in a

decreased sensitivity and in the inability to perceive any or the proper amount of displacement of the elements of the target when artificial incongruities are produced by means of size lenses. No means of measurement or correction of such incongruities are available as yet.

Another type of aniseikonic error which may be more or less systematic in character is that produced by an anomalous asymmetric incongruity of the two ocular images. One form, not infrequently encountered, is an anomalous horizontal incongruity of the two ocular images where the images from the nasal sides of the retinas are greater than those from the temporal side (that is, temporal field larger than nasal). To the observer with such a condition a flat surface situated normal to him, may appear to be convex toward him or flat and nearer. If the asymmetric incongruity is greater temporally than nasally, the surface may appear either concave or flat and farther away. At present, methods of determination and correction of this type of incongruity are being studied.

Asymmetric incongruity can be in meridians other than the horizontal meridian and in one eye only. Such types of anomalous asymmetric incongruity make themselves apparent in the anomalous appearances of the elements of the cross, as when one or more of the arms are tilted backward or forward from the plane of the cross. The exact nature of these types of asymmetric incongruity requires further study.

#### DISCUSSION

The space eikonometer has been in daily use in the Clinical Division of the Dartmouth Eye Institute since July, 1941. During this time it has been possible to evaluate the test from the standpoint of practical clinical application.

Quite early in the investigations it was

established that a high correlation existed between the measurements of aniseikonia obtained with the standard eikonometer and those obtained by anomalous space perception on the space eikonometer.<sup>7</sup>

This actually should be interpreted as a validation of the principle of the standard eikonometer procedure, since anomalous binocular space perception can be accounted for only in terms of image size differences and not in terms of anisophoria or differential fusional movements of the eyes as has been suggested<sup>8</sup> with regard to the standard eikonometer findings.

Clinical experience has shown that, in general, the space-eikonometer-test procedure consumes considerably less time and provides an easier discriminative task for the patient than does the standard eikonometer procedure. Such factors as fixation disparity, phoria variability, and poor fixation ability, which make discrimination a difficult task for many patients during the latter test, do not enter into the space eikonometer test to complicate the procedure. Certain exceptions exist, however. Patients who have binocular vision but no stereopsis can usually be handled more satisfactorily with the standard eikonometer.

It must be emphasized, however, that the ordinary tests for stereopsis do not provide criteria for determining whether the patient may or may not be measured on the space eikonometer. Individuals with little or no central (axial) stereopsis can be measured on the space eikonometer with considerable accuracy provided they manifest peripheral stereopsis.

Over and above these obvious practical advantages the space eikonometer provides a means for determining meridional aniseikonia at oblique axes. It should be pointed out here that the majority of cases with astigmatism at oblique axes can be expected to demonstrate a meas-

urable amount of this form of aniseikonia.<sup>9</sup> Cases have been studied in which the full astigmatic (oblique) correction could be tolerated only when the associated aniseikonia was also corrected.<sup>10</sup> It is common clinical experience to have patients with astigmatism at oblique axes report various distortions of their environment following correction of their refractive error. With constant wearing of the correction these distortions often disappear after a few days. It has been customary to assume that their disappearance represented simply an adaptation to the new correction.

It must be borne in mind, however, that the usual surroundings contain an abundance of uniocular clues to spatial orientation (rectilinear perspective, size, brightness, shadows, familiar forms, and the like) to which the individual may respond. That he does so is evidenced from the fact that even after "adaptation" has taken place, the spatial distortions immediately become manifest when he is placed in surroundings lacking in uniocular clues.<sup>4</sup> Such surroundings may be natural, as in the woods, open country, or on the water, or artificial, as in the environments provided by aniseikonic test apparatus in which they can be measured. Unless the aniseikonic errors are corrected there remains, in spite of this "adaptation" to normal surroundings, a basis for conflict between the responses to the uniocular and binocular clues which can be troublesome and productive of further symptoms. The "adaptation," then, simply means that the patient is not utilizing binocular vision with full efficiency, but is disregarding binocular stereoscopic clues and relying predominantly upon uniocular clues for spatial orientation.

From such considerations it may be concluded that interpretation of the nature of the patient's anomalous spatial



localization provides a basis for a clearer understanding and evaluation of the patient's symptoms in terms of his actual function and performance. From the point of view of efficiency of function, in so far as there is any disregarding or suppression of the binocular stereoscopic clues, the accuracy of the patient's binocular spatial localization is, to that extent, impaired.

It should be emphasized here that this impairment represents, in essence, a lack of correspondence between the visual localization and the actual location of the external environment. Considered from the standpoint of stimulus-response relationships and the role of sensory impressions as determinants of behavior, this clearly becomes a matter of broad, general sig-

nificance. The inadequacies and errors in performance resulting from such lack of correspondence can have a profound effect upon the individual in providing a basis for conflicts and frustrations. The nature and severity of the effects vary with the individual and are conditioned by such factors as the nature of his visual environment, the nature of the visual requirements of his occupation, his general motivation, and his health. Thus, not only do our concepts of the functional aspects of aniseikonia become clarified but an analytic approach is indicated which should be helpful to the clinician when utilized in diagnosis and considerations of therapy.

*Dartmouth Eye Institute.*

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# PERFORATING OCULAR INJURIES\*

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This report is based on a study of the records of 172 cases of perforating ocular injuries of patients who were admitted to the wards of the Wilmer Ophthalmological Institute during the years 1935 to 1942, inclusive.

The selection of these 172 cases was made from a total of approximately 275 both public and private ward patients. Some records were discarded either because they were incomplete or because there was an inadequacy of postoperative follow-up observation. Also discarded were the records of all patients with perforating ocular injuries who had received definitive treatment before coming to the hospital, or in whom examination had been so long postponed that the outcome was determined before treatment could be instituted. The study does not include nonperforating injuries, or cases of subconjunctival scleral rupture. Cases of retained intraocular foreign bodies are included. Of the 275 records which were reviewed, 47, or 17 percent, were discarded because enucleation was performed without any attempt being made at repair, it being considered that the eyes were hopelessly lost. Figures including these 47 enucleated eyes, however, appear later in the discussion of the influence of the length of the laceration on recovery, and in the computation of the incidence of sympathetic ophthalmia.

In this study there are no rigid specifications of minimal postoperative observation; thus there are included all records in which it seemed reasonably cer-

tain that the visual acuity had reached its final level at the time of the last recorded examination. This method of selection may have led to the occasional inclusion of a case as a "successful" result which may later have developed serious complications. On the other hand, there are included a few cases in which further operative treatment (for example, discission or capsulectomy) might have produced an improvement of the final visual acuity.

Applying these methods of selection, there are available for review the records of 172 cases of recent perforating ocular injuries, in each of which an attempt was made to save the eye.

The cases were analyzed and, as far as possible, studied statistically in the attempt to illuminate the following problems:

- A. What average degree of success was achieved?
- B. What are the principal complications that influence the outcome?
- C. What are the best methods of management?

Each of these items is discussed below under separate headings.

## AVERAGE DEGREE OF SUCCESS

The degree of success expressed in final visual acuity achieved in the treatment of these injured eyes is given in table 1. Fifty-two patients, or 30 percent, regained a corrected visual acuity of 20/40 or better. (There are 12 cases in which the visual acuity could not be measured because the patients were too young to coöperate. In these cases the final examination disclosed nothing that should interfere with visual acuity. These cases are included in the 20/100 column in all tables.) In 47 cases the end result was loss of all light perception, enucleation

\* From the Wilmer Ophthalmological Institute of the Johns Hopkins Hospital and University. Presented in part before the New York Academy of Medicine, Section of Ophthalmology, Dec. 20, 1943.

TABLE 1  
OUTCOME AS TO VISUAL ACUITY WITH CORRECTION—172 CASES

Visual Acuity	20/20 to 20/40	20/50 to 20/100	20/200 to 10/200	9/200 to 1/200	Light Projection	Light Perception	Blind
Number of each	52	34*	7	18	5	9	47**
Percent	30	20	4	11	3	5	27

\* Includes 12 cases in which the visual acuity could not be measured.

\*\* 44 of these were enucleated.

being performed in 44 of these. There remain 39 cases in which the final visual acuity varied from 20/200 to the ability to perceive light. In this series, the visual-acuity figure is an accurate index of the usefulness of the injured eye, there being no case in which there was extensive loss of the visual field without associated reduction of central vision.

Thus, in the treatment of the 172 cases of perforating ocular injuries, 50 percent of the patients achieved a final visual acuity of 20/100 or better, and 50 percent of 20/200 or worse.

#### THE INFLUENCE OF COMPLICATING FACTORS

In perforating ocular injuries there are numerous factors and complications that may influence the final visual outcome. A complete study of the role and the interrelationship of each of these numerous possible variables in the course and outcome of such injuries is impossible in a clinical series of this size. Nevertheless, it is important to break down the over-all

figures in a study of the role of a few factors which, on the basis of general experience, are presumed to be important. This has been done for the following factors and complications: (1) the age of the patient, (2) the agent causing the injury, (3) the length of the laceration, (4) the location of the laceration, (5) the degree and nature of prolapse of intraocular contents, (6) the degree of damage to the lens, (7) the degree of intraocular hemorrhage, (8) the occurrence of infection, (9) the occurrence of sympathetic ophthalmia, and (10) the presence or absence of retained intraocular foreign bodies.

(1) *Age.* The age distribution for the 172 cases analyzed is shown in table 2. The patients of 40 years or over are grouped together because of their relatively small number. In this table there are no striking variations in the average levels of visual acuity achieved in the various age groups, except that the figure of 36 percent regaining 20/100 corrected vision or better for the group 40 years

TABLE 2  
OUTCOME IN VISUAL ACUITY ACCORDING TO AGE

Age yrs.	No.	20/20 to 20/40	20/50 to 20/100	20/200 to 1/200	Light Perception	Blind	20/100 or Better, percent
0-4	18	1	7	—	1	9	44
5-9	31	13	3	5	1	10	50
10-19	47	17	4	10	1	11	51
20-29	24	8	6	4	3	3	58
30-39	27	10	5	—	4	8	54
40+	25	3	6	6	4	6	36

and over is lower than the average. For old individuals, it might be assumed that such factors as delay and imperfection in healing, or increased vascular fragility, or diminished resistance to infection contribute to a poorer average of satisfactory recoveries. However, in the 25 cases falling in the age group of 40 years or over, reopening of the wound or delay in re-formation of the anterior chamber occurred in three cases, unusual hemorrhage occurred in three cases, and intraocular infection occurred in four cases, with one

ly little maceration of tissue. The same principle apparently applies in this series to perforating injuries by wooden splinters.

The few instances of gunshot wounds indicate that this type of perforating ocular injury has a poor prognosis, undoubtedly because of the disorganization of the ocular tissues secondary to the explosive force of bullet impact, and the usual double perforation of the globe. Blunt injuries appear to carry a poor prognosis; often trauma from a blunt

TABLE 3  
OUTCOME ACCORDING TO THE AGENT CAUSING THE INJURY

Agent	No.	20/20 to 20/40	20/50 to 20/100	20/100 to 1/200	Light Perception	Blind	20/100 or Better, percent
Glass	43	16	13	4	4	6	67
Wood	27	12	4	3	2	6	59
Metal	63	15	13	9	4	22	44
Blunt	8	1	2	2	0	3	38
Gunshot	6	1	0	1	1	3	17
Miscellaneous, unknown	25	7	2	7	3	6	35

recovery. The incidence, for this age group, of each of the aforementioned complications is similar to that for the entire series (see below). The data do not show an influence of the age of the patient on recovery. The possible effect of senility cannot be determined because of the small number of older patients.

Recapitulation: The age of the patient is not demonstrated to have an influence on the outcome in terms of visual acuity. The data are inconclusive because of the limited number of persons of advanced age.

(2) *Agent.* The data as to the influence of the agent causing the injury on the final outcome are given in table 3. Lacerations caused by glass appear to have the best prognosis, most probably because such lacerations are usually very clean and straight, and are associated with relative-

object (brick, fist, and so forth) ruptures the globe, owing to its explosive force. Moreover, a direct laceration from a blunt object is very apt to have ragged and macerated margins.

Recapitulation: The influence on the outcome of the agent causing the injury appears to be roughly proportional to the sharpness of the agent. Bullet wounds and blunt injuries carry a poor prognosis.

(3) *Length of laceration.* Table 4 shows the outcome in visual acuity following lacerations of various lengths. To eliminate some variables, there are included in table 4 only cases of corneal or of corneoscleral lacerations, and those of retained intraocular foreign bodies are excluded. Thus, it is seen in table 4 that when the visual results are grouped as better or worse than 20/100, there is no striking relationship between the length

of the laceration and the average outcome in terms of visual acuity. However, if the cases are grouped as better or worse than 20/40 visual acuity, it is seen that the number regaining normal or nearly normal vision falls off steadily as the length of the laceration increases. Evidently the longer the corneal scar the greater is the chance it will interfere with vision, even

tions, the data concerning the influence of the length of the wound on the final outcome demonstrate the following points:

First, lacerations of 1 to 4 mm. in length are nearly as dangerous as lacerations of 5 to 8 mm.

Second, there are several instances of recovery from lacerations over 8 mm. in length, which demonstrates that satisfac-

TABLE 4  
OUTCOME ACCORDING TO THE LENGTH OF THE LACERATION\*

Length mm.	No.	20/20 to 20/40	20/50 to 20/100	20/200 to 1/200	Light Perception	Blind	20/100 or Better percent	20/40 or Better percent
1 to 2	22	11	1	3	1	6	55	50
3 to 4	35	15	8	6	2	4	66	43
5 to 6	23	6	6	6	—	5	52	26
7 to 8	24	5	7	2	—	10	50	21
9 and over	14	2	4	—	4	4	43	14

\* Corneal or corneoscleral lacerations only, excluding cases with retained intraocular foreign bodies.

though healing proceeds satisfactorily in all other respects.

It must be realized that in this series a strong element of selection operates as far as the length of the laceration is concerned. The amount of organic damage done to eyes is often pertinent to the length of the laceration—in general, short lacerations tend to produce less organic damage than do long lacerations. Since the decision to enucleate or not to enucleate an injured eye is based on the clinical picture and the amount of organic damage produced by the injury, in general, eyes that have long lacerations are enucleated more frequently, no attempt being made at repair, than are eyes with short lacerations. Thus of the 47 eyes enucleated immediately, without attempt to repair, 80 percent had lacerations of 8 mm. or over. This automatic exclusion of a great number of eyes with long lacerations, weights the figures in this study in favor of short lacerations.

With due allowance for these limita-

tory healing may occur in the presence of long lacerations. (On the other hand, there is every reason to believe that a great majority of the eyes with long lacerations which were enucleated immediately would not have healed satisfactorily had repair been attempted.) On the basis of these observations, it is reasonable to assume that it is such factors as the degree of the explosive force of the blow or of the severity of intraocular hemorrhage that are the determining factors, and the actual length of the laceration is only incidental.

Recapitulation: No correlation is demonstrated between the length of the laceration and the percentage of satisfactory recoveries for wounds under 9 mm. in length. The data are severely influenced by the tendency to enucleate immediately nearly all eyes that have sustained a long laceration.

(4) *Location.* In table 5 are presented the data on the outcome correlated with the location of the laceration. Forty-seven

TABLE 5  
OUTCOME ACCORDING TO THE LOCATION OF THE LACERATION

Location	No.	20/20 to 20/40	20/50 to 20/100	20/200 to 1/200	Light Perception	Blind	20/100 or Better, Percent
Cornea	114	35	19	20	7	33	47
Ciliary body	15	8	1	4	0	2	60
Cornea and Ciliary body	31	8	10	1	3	9	58
Sclera	6	2	2	—	1	1	67
Double perforation	6	—	1	1	2	2	17

percent of the eyes in which the laceration was confined to the cornea achieved a visual acuity of 20/100 or better. Involvement of the sclera in the region of the ciliary body, with or without extension into the cornea, does not have an adverse influence, since 58 percent of eyes with such lacerations regained visual acuity of 20/100 or better. Perforating lacerations posterior to the ciliary body are less frequent, occurring only six times in this series, and no conclusions can be drawn as to the relative seriousness of such injuries. Double perforations of the globe apparently rarely heal with retention of useful vision, although the number of such cases is so small the data are of no statistical significance.

Recapitulation: The location of the laceration is not demonstrated to have an effect on the average of successful recoveries. A double perforation of the globe appears to have an unfavorable effect.

(5) *Prolapse*. The disorganization produced in the eye by severe degrees of prolapse of the intraocular contents is so obvious that it needs no further discussion. When serious degrees of prolapse are met with in perforating ocular injuries, the picture is so evidently hopeless that it is only exceptionally that any attempt at repair is undertaken. The effect of major degrees of prolapse is agreed to be devastating and needs no further demonstration. It is, however, of interest to

assess the not-so-obvious influence of minor degrees of prolapse.

Prolapse of the iris in a corneal laceration has often been regarded as a natural defense mechanism against infection. Is this concept in accord with the findings for this series? There are in this series 145 cases of corneal laceration, including those extending into the sclera. Prolapse of iris or ciliary body occurred in 91 of these cases; and in 54 there was no prolapse of iris or ciliary body. Of the 91

TABLE 6  
THE EFFECT OF PROLAPSE OF IRIS UPON THE DEVELOPMENT OF INFECTION

Iris Involvement	Lens Damaged		Lens Intact	
	No.	% Infected	No.	% Infected
Prolapsed	38	21	53	3.8
Not prolapsed	33	33	21	19

eyes in which prolapse of iris or ciliary body occurred, 12, or 13 percent, developed an intraocular infection. Of the 54 uncomplicated by prolapse, 15, or 28 percent, developed an intraocular infection (table 6). The figures suggest that the incidence of infection complicating corneal wounds is reduced by the presence of a prolapse of the iris. However, since there is a correlation between infection and injury of the lens, the incidence of lens damage is also shown in table 6. Again, there is an apparent antiseptic effect of prolapse of the iris, but the figures fall short of statistical value.

TABLE 7

OUTCOME ACCORDING TO THE OCCURRENCE OF PROLAPSE OF IRIS\*

Iris Involvement	No.	Average Length mm.	20/100 of Better, percent	Blind, percent
Prolapsed	60	5.1	60	15
Not prolapsed	28	4.5	71	11

\* Corneal or corneoscleral lacerations, not infected, excluding cases with intraocular foreign bodies.

It remains to be seen if prolapse of the iris has any further significance as regards recovery from corneal wounds. In an effort to isolate as much as possible the role of prolapse of the iris, those cases complicated by infection or by retained intraocular foreign bodies were for the moment discarded. This left 88 cases of corneal or corneoscleral lacerations, in 60 of which there was prolapse of iris, and in 28 no prolapse. Table 7 indicates that recovery of vision is little influenced by the occurrence of prolapse of the iris, in the absence of infection.

Prolapse into a corneal wound of lens material with or without uveal tissue occurred 10 times. Six of these eyes ultimately were removed, and only one regained visual acuity of 20/100 or better. These figures may not be significantly different from those given in table 8, which shows the degree of success achieved in the presence of injury to the lens, with and without prolapse of lens substance.

Recapitulation: Prolapse of the iris in a corneal laceration is not observed to influence the outcome; its occurrence is not demonstrated to be associated with a reduced incidence of infection, although there is suggestive evidence of such an effect.

(6) *Lens damage.* The data showing the influence of damage to the lens in perforating ocular injuries are given in table 8. Of 73 eyes in which the lens remained intact, 75 percent regained a final corrected visual acuity of 20/100 or better, and 14 percent eventually came to enucleation. On the other hand, of 56

TABLE 8

OUTCOME ACCORDING TO THE OCCURRENCE OF INJURY TO THE LENS\*

Lens Involvement	No.	20/100 or Better percent	20/200 or Worse percent	Blind percent
Lens intact	73	75	25	14
Lens injured	56	29	71	45
Stationary or late lens changes	18	55	45	11

\* Cases with intraocular foreign body excluded.

eyes in which the lens was either punctured or ruptured, 29 percent recovered a corrected visual acuity of 20/100, and 45 percent were ultimately enucleated. There remains a group of 18 cases in which there were either small, localized lens opacities which did not progress, or in which lens opacification developed late in

TABLE 9

ENUCLEATED EYES  
CHIEF FINDINGS ON MICROSCOPIC EXAMINATION

Lens Involvement	Disorganized Globe	Sympathetic Ophthalmia	Massive Hemorrhage	Non-specific Uveitis	Purulent Endophthalmitis	Phthisis Bulbi	Retinal Detachment
Lens intact, 9 cases	1	2	1	1*	1	2*	1
Lens injured, 28 cases	3	—	2	7**	12	4	—

\* Both had had clinical evidence of intraocular infection.

\*\* Includes 3 cases with previous clinical evidence of infection.

the period of observation, presumably because of some secondary influence. Those cases involved by intraocular foreign bodies are not included.

These data indicate a malignant effect of traumatic cataract in cases of perforating ocular injuries. They raise the question of how a pathogenetic effect is exercised by the damaged lens. This problem was attacked first, by a study of the causes of reduction in visual acuity in eyes removed, comparison being made in each instance of the eyes that had suffered lens damage with those in which the lens was uninjured.

The histologic findings of the enucleated eyes are given in table 9. To reduce the number of possible variables, cases complicated by an intraocular foreign body are excluded. In comparing the findings according to the presence or absence of lens injury, two important differences stand out: First, the number of eyes lost through infection, and, second, the incidence of posttraumatic uveitis are both greater among those eyes which received damage to the lens. The question of infection is discussed more fully below. However, attention is here called to table 13, which shows the incidence of purulent infection for the entire series, and its much more frequent occurrence among cases complicated by injury to the lens.

Turning aside for the moment from the question of purulent infection, it was noted in the foregoing account that the occurrence of posttraumatic uveitis appeared to be favored by the presence of damage to the lens. To determine to what extent lens damage could be responsible for this posttraumatic uveitis, comparison of the incidence of posttraumatic uveitis in retained eyes, in the presence and in the absence of lens damage, was made, and is shown in table 10. Since the role of purulent infection has already been demonstrated, all instances of clinical evidence

of infection are omitted in table 10, which refers only to corneal and corneoscleral lacerations, cases in which there were intraocular foreign bodies also being ex-

TABLE 10

INCIDENCE OF POSTTRAUMATIC UVEITIS\*

Lens Involvement	Non-specific Uveitis	Uveitis Phaco-anaphylactica	Sympathetic Ophthalmia
Lens intact, 62 cases	0	0	0
Stationary or late lens changes, 16 cases	0	0	0
Lens injured, 31 cases	9	3	1

\* Excluding instances of purulent infection, or of intraocular foreign bodies, and not including enucleated eyes.

cluded in an effort to isolate the variable under consideration. It is seen that posttraumatic or postoperative uveitis occurred in 12 of 31 cases in which there was traumatic cataract, and occurred in no instance among those 78 cases in which the lens was intact (including cases with nonprogressive lens opacities or with late lens changes). The classification of uveitis phaco-anaphylactica rests upon the demonstration of an abnormal skin sensitivity to lens protein on intracutaneous injection. One instance of uveitis was almost certainly sympathetic ophthalmia, as demonstrated by a granulomatous uveitis of the second eye coming on 14 weeks after injury, in association with a positive skin test for uveal pigment. The occurrence of uveitis contributed to a reduction in visual acuity in a number of cases (table 11). Perhaps a more serious attribute of the complication is that it suggests the danger of sympathetic ophthalmia and encourages enucleation. In this way, a relatively benign posttraumatic iritis may cause the loss of an eye which otherwise might have recovered.

It is thus seen that the complication of injury to the lens contributes to unsatisfactory healing in two respects: It in-



creases the incidence of purulent intraocular infection, and it increases the incidence of posttraumatic uveitis. It remains to be seen if these sources of failure comprise in full the pathogenetic effects of the damaged lens. With this end in view, table 11 has been constructed, giving the cause for reduction of vision (below 20/40) in surviving eyes, again excluding cases complicated by infection or by retained intraocular foreign bodies, and in-

Recapitulation: Injury to the lens exerts an adverse influence on the final visual outcome. Its principal deleterious role lies in the tremendously increased incidence of purulent infection and of posttraumatic uveitis. In the absence of these complications, injury to the lens does not influence the prognosis for recovery of vision.

(7) *Hemorrhage*. Minor degrees of hemorrhage into the anterior chamber or

TABLE 11  
CAUSE FOR REDUCTION OF VISUAL ACUITY\*

Lens Involvement	Visual Acuity 20/40 or Better	Visual Acuity Reduced to 20/50 or Worse by:						
		Corneal Scar	Post-iritis Changes	Capsular Remains	Vitreous Opacities	Retinal Damage	Phthisis Bulbi	Cause Uncertain
Lens intact, 62 cases	42	9	—	—	3	2	1	5
	68%	14.5%	—	—	5%	3%	1.5%	8%
Lens injured, 31 cases	9	6	4	8	—	—	2	2
	29%	19%	13%	26%	—	—	6.5%	6.5%

\* Corneal or corneo-scleral lacerations, not infected, without intraocular foreign body.

cluding corneal or corneoscleral lacerations only. In table 11, the increased incidence of visual failures among cases presenting an injured lens is accounted for almost completely by two factors; first, by several instances of post-iritis changes (synechiae, occluded pupil, cyclitic membrane, and the like) sufficient to cause reduction of vision; and secondly, by opacities derived from the remains of incompletely removed traumatic cataract.

On the whole, there are three reasons why injury to the lens is associated with such a less-favorable, average outcome— incomplete removal of a traumatic cataract, and the complications that follow either a purulent infection or a post-traumatic uveitis. If these complications do not develop, the chances of recovery of vision in perforating ocular injuries are equally good regardless of the occurrence of traumatic cataract.

into the vitreous were not demonstrated to have any relation to the final visual outcome. For the sake of simplicity these data are omitted. There are 18 cases in this series in which severe intraocular hemorrhage was devastating. Three of these cases were further complicated by an intraocular infection, leaving 15 cases for analysis.

Of the 15 uninfected eyes which sustained severe intraocular hemorrhage, 8 were eventually enucleated. One of these developed sympathetic ophthalmia, and it is possible that hemorrhage may have had some influence on the outcome, since a severe intraocular hemorrhage, occurring on the third postoperative day, resulted in secondary glaucoma, which was treated by lavage of the anterior chamber. Two cases showed, in addition to the hemorrhage, a subacute inflammatory reaction that kept the eyes dangerously irri-

tated for several days after repair, so that they were enucleated as potentially sympathogenic. One of these two had sustained a through-and-through injury from a knife, and a cilium was discovered in the posterior wound. Two others were in phthisis at the time of enucleation. In the sixth case there was a badly disorganized globe. In the remaining two, there was massive subretinal hemorrhage; one of these eyes was enucleated because of a painful secondary glaucoma and another because it failed to clear after repair and was considered potentially dangerous.

Of the seven eyes that sustained severe intraocular hemorrhage and were not enucleated only one recovered useful vision. Three developed phthisis bulbi. None of these three received any second operation which might have contributed an added insult. In two, haziness of the vitreous persisted and reduced vision to light perception with accurate projection. One of these had a through-and-through laceration, evidenced by roentgenographic demonstration of a foreign body in the orbit. The other had a short corneal laceration without evidence of damage to the lens, in which a severe vitreous hemorrhage did not clear in 70 weeks. In one a cyclitic membrane developed across the pupillary space.

These cases illustrate well three disastrous effects of intraocular hemorrhage. In the first place, hemorrhage has a tremendous disorganizing effect, dislocating the intraocular contents and often sweeping them out through the laceration, as in an operative expulsive hemorrhage. Secondly, intraocular hemorrhage has an irritative effect, exciting an inflammatory response which is always alarming, and occasionally ends with the formation of a cyclitic membrane and phthisis bulbi. In the third place, for little-understood reasons, hemorrhage in the anterior chamber instead of becoming absorbed may proceed to organization, with the formation

of heavy scars obliterating the pupil and the chamber angle, and in the vitreous chamber may produce destruction of the retina and detachment.

Intraocular hemorrhage is, in all likelihood, frequently responsible for the quiet passing into phthisis of many injured eyes whose original appearance had encouraged optimism. An inconspicuous posterior-chamber hemorrhage, for example, may give rise to a low-grade iritis, or may organize and initiate a cyclitic membrane; or an overlooked choroidal hemorrhage may end in retinal detachment, and so forth.

Recapitulation: It is evident that severe intraocular hemorrhage is usually recognizable clinically, and produces such a serious picture that the eyes are often promptly removed. The outlook for recovery of vision in those that are treated surgically is poor, for the following reasons: (a) The disorganizing effect of intraocular hemorrhage, (b) the irritating effect of and inflammatory reaction to hemorrhage, and (c) the occasional tendency of hemorrhage to organize.

(8) *Infection.* Microscopic examination of the 44 enucleated eyes showed positive evidence of intraocular infection in 17, the largest single pathologic finding in the group of enucleated eyes. In nine other cases, definite clinical evidence of infection was present, although histologic proof was lacking because enucleation was not performed (five cases), or because the process had passed through the stage of purulent inflammation by the time of enucleation (four cases).

The clinical evidence for the presence of infection in the nine cases wherein histologic demonstration was lacking is as follows: Of the five eyes which were not enucleated, two had a corneal abscess at the site of the perforation with hypopyon; one had frank pus in the anterior chamber; and the other two had clinical evidence of a less severe purulent intraocu-

lar reaction. Of the four eyes which were removed after passing through the stage of purulent reaction, one had a hypopyon of the anterior chamber and *B. subtilis* was cultured from the discharge before repair; one was described as "a severe intraocular infection," and *B. coli* was cultured clinically; one was described as "grossly infected," with a heavy growth of *Staph. aureus* on culture, and the fourth had purulent exudate in the anterior chamber, with a heavy growth of *Staph. aureus* on culture. On pathologic examination of these four eyes after enucleation, three showed subacute intraocular inflammation, not purulent in type, and similar to that occurring in untraumatized eyes with severe uveitis. The sections of the eye from the fourth case showed phthisis bulbi with a cyclitic membrane, and practically no active inflammation.

The subsidence of an acute purulent endophthalmitis without perforation and the progress of the eye into phthisis is, of course, an old observation. It is further exemplified in this study by two other cases. In both of these iridectomy was performed at the height of the inflammation and the biopsy specimen from the iris showed acute purulent inflammation. The eyes later came to enucleation and both showed phthisis bulbi with little active inflammatory residue.

Seven of the 44 enucleated eyes showed, on the microscopic sections, a subacute type of intraocular infection, although there was no clinical nor bacteriologic evidence of purulent inflammation. Since there is no way of determining with certainty whether these eyes were the site of a traumatic uveitis or a low-grade infection, these eyes cannot be classified as "infected," although this etiology cannot be ruled out.

The incidence of infection in the entire series of 172 cases was 26 cases, or

15.1 percent. Among the 47 eyes which were enucleated after the first examination without any attempt at repair or treatment, purulent endophthalmitis was present in 11. The incidence of infection for the total 275 injured eyes from which the material was selected was 40, or 14.5 percent.

The seriousness of infection complicating penetrating injuries is shown in the fact that of the 26 cases in which this diagnosis was made clinically or pathologically all but 5 eyes were enucleated. Of the five eyes that were retained, one ended with loss of all light perception. In the remaining four eyes, all of which recovered good vision, two had corneal abscess with hypopyon. While the clinical picture indicated that infection actually was present within the eye, it is possible that in these cases the infection was restricted to the cornea and the intraocular contents were not invaded. Of the two eyes in which recovery from a clinically diagnosed purulent endophthalmitis occurred, both received intensive therapy, one with sulfathiazole and one with sulfapyridine. Thus, of the 26 eyes in which the diagnosis of purulent endophthalmitis was made, 22 lost all vision, and 4, or 15 percent, regained 20/40 vision or better.

The influence of the sulfonamides in the treatment of intraocular infection following penetrating injuries is shown in table 12. Thirteen patients received intensive treatment by the oral use of one of the sulfonamides, and of these three recovered. Thirteen others were not so treated, and of these one recovered. These data indicate that the sulfonamides, while probably of great value in a few cases, are on the whole unsatisfactory in the treatment of intraocular infections complicating penetrating ocular injuries.

There is long-standing, well-documented evidence that lens cortex acts as an

TABLE 12

SULFONAMIDES IN THE TREATMENT OF PURULENT INTRAOCULAR INFECTIONS FOLLOWING PENETRATING INJURIES

Drug	No.	Days from Injury to Onset of Treatment	Duration of Treatment, days	No. with Lens Damage	Enucleated	Recovered
Sulfanilamide	1	3	4	1	1	
Sulfapyridine	3	3	10	2	2	1
Sulfathiazole	7	1 to 5	5 to 21	7	6	1
Sulfadiazine	2	1, 3	10	1	1	1
TOTAL TREATED	13			11	10	3
NO SULFONAMIDE TREATMENT	13			9	11	1

excellent culture medium for bacteria of all degrees of virulence, and that damage to the lens in a perforating ocular injury greatly enhances the occurrence of intraocular infection. The findings in this study are in no way at variance with this principle, as shown in table 13. Of the 26 eyes in which the diagnosis of purulent inflammation was made, 20 sustained damage to the lens and 6 did not. Conversely, for the whole series without regard to the presence or absence of other complicating factors, 78 eyes received damage to the lens and 26 percent of these were infected, while 94 had no damage to the lens, and of these only 6 percent were infected.

Fifty-six of the patients in this study received either sulfathiazole or sulfadiazine as a prophylactic measure. The oral use of the sulfonamide was begun immediately on admission of the patient to the hospital, although there was no evidence of infection. Of these 56 eyes, 6, or 10.7 percent, subsequently developed a purulent endophthalmitis. In five of these six cases, use of the drug was begun within 24 hours after injury; in the other, 40 hours after injury.

One hundred sixteen patients received no such "prophylaxis" against infection. Twenty of these, or 17.2 percent, subsequently developed a purulent endophthalmitis. These figures do not demonstrate that any marked benefit is obtained

from the routine oral use of a sulfonamide in every case of penetrating ocular injury, the observed difference not being significant statistically. On the other hand, modern concepts of infection lead to the supposition that, in a given instance, the occurrence of infection depends on the balance between the resistance of the

TABLE 13

INFLUENCE OF DAMAGE TO THE LENS AND THE ROLE OF PROPHYLACTIC SULFONAMIDES IN THE DEVELOPMENT OF INFECTION

Drug	Lens	No.	No. Infected	Percentage of Totals
None	Intact	66	6	17.2
	Injured	50	14	
Sulfathiazole	Intact	14	1	
	Injured	20	4	
Sulfadiazine	Intact	14	—	10.7
	Injured	8	1	
ALL CASES		172	26	15.1

host and the number and virulence of the invading organisms. In a situation where these opposing forces are closely balanced, the use of any chemotherapeutic agent may well decide the outcome. The data given imply no argument against the prophylactic use of sulfonamides, and the routine use of chemotherapeutic agents, both in prophylaxis and as therapy, will, in all probability, save at least a small number of eyes which otherwise would be lost.

It has been mentioned that postoperative uveitis may be occasionally related to infection. It is therefore of interest to learn if the use of a sulfonamide influences the incidence of uveitis. Table 14 shows that after the exclusion of those cases diagnosed as purulent intraocular infection, the "prophylactic use of the sulfonamides did not influence the occurrence of posttraumatic uveitis.

TABLE 14

THE ROLE OF PROPHYLACTIC SULFONAMIDES IN THE DEVELOPMENT OF UVEITIS\*

Prophylaxis	Posttraumatic uveitis	
	No.	Percent
Sulfathiazole or sulfadiazine, 50 cases	9	18
No sulfonamide, 96 cases	17	17.7

\* Instances of purulent endophthalmitis excluded.

Recapitulation: The incidence of purulent intraocular infection in this series of penetrating ocular injuries was 15 percent. The incidence of infection was four times greater in those eyes which had sustained damages to the lens than among those in which the lens was uninjured. The chances of the development of an infection following a penetrating injury is not definitely reduced by the oral use of "prophylactic" sulfonamides. The outlook for recovery of an infected eye is very poor, and is only occasionally improved by the oral use of sulfonamides.

(9) *Sympathetic ophthalmia*. There were 3 instances of sympathetic ophthalmia among the 172 cases herein reported. Thirteen eyes in this series were enucleated within 14 days after injury, and could hardly be expected to have developed sympathetic ophthalmia in this short interval. Therefore, the incidence of this disease among eyes retained long enough for its development is 3 out of 159, or 1.9 percent. If the 56 cases which were

discarded as incomplete or inadequately followed, and in which there was no evidence of sympathetic ophthalmia when last seen, are included, the incidence of sympathetic ophthalmia is 3 in 215, or 1.4 percent. This approximate figure 1.4 percent probably represents very closely the true incidence in this series, and is similar to that reported by other authors, according to a review by Woods\* in 1936. The three instances of sympathetic ophthalmia are summarized below.

The first was in a white girl, aged 7 years, who sustained a small perforating corneal wound near the limbus, with prolapse of iris, and without evidence of injury to the lens. After repair with iridectomy and a conjunctival flap, the eye recovered uneventfully and, two weeks after injury was free of signs of intraocular inflammation and apparently healed. During the fourth week, a bilateral uveitis developed, characteristic of sympathetic ophthalmia. The injured eye was promptly removed, and the sympathizing eye quieted down and returned to normal. Microscopic examination of the sympathicogenic eye confirmed the clinical diagnosis.

The second patient was a white boy, aged 14 years, who sustained a corneal laceration at the limbus, with prolapse of iris, the lens apparently remaining uninjured. Iridectomy was performed, and a conjunctival flap drawn over the wound. A good recovery appeared to be under way, but, on the third day, a severe spontaneous intraocular hemorrhage occurred. The hemorrhage proceeded to organize, a secondary glaucoma developed, and blood staining of the cornea took place. An unsuccessful attempt was made to remove the blood from the anterior chamber. After this, the eye began quietly to go

\* Woods, A. C. *Sympathetic ophthalmia*. Part I. *Amer. Jour. Ophth.*, 1936, v. 19, pp. 9-15.

into phthisis. Three months after injury, the uninjured eye developed a mild uveitis. The cornea of the injured eye was by this time opaque. The injured eye was removed, and the diagnosis of sympathetic ophthalmia confirmed by microscopic examination. The sympathizing eye quieted down and has remained normal. This patient was known to have a strong bleeding tendency which nearly cost him his life on two occasions, when subjected to tonsillectomy and appendectomy.

The third case was unproved. A Negro boy, aged 15 years, received a small penetrating injury of the cornea and traumatic cataract. The corneal wound healed spontaneously, without prolapse of iris. Eighteen days after injury, iridectomy and lavage of the cataract were performed. Following this operation a uveitis set in, diagnosed (on the basis of an abnormal skin reaction to beef-lens protein injected intracutaneously) as iritis phaco-anaphylatica. Under desensitization treatment with lens protein and staphylococcus toxin\* the injured eye quieted down and two months after injury or five weeks after operation was free of signs of intraocular inflammation. During the third month pain set in in both eyes, and when the patient returned for examination a severe bilateral uveitis had developed, clinically characteristic of sympathetic ophthalmia. Treatment was by means of artificial fever induced by 10 intravenous injections of killed typhoid bacilli. Both eyes gradually recovered without further complication. The injured, aphakic eye finally achieved corrected visual acuity of 20/40, and the opposite eye, of 20/20.

There are several points of interest in regard to the cases of sympathetic oph-

thalmia in this series. In the first case, the injured eye was healing itself without the slightest clinical trace of untoward reaction; two weeks after injury it had every appearance of a perfect result. Obviously, uneventful healing does not exclude the danger of the later development of sympathetic ophthalmia. The second patient received intensive treatment with sulfadiazine for the first 6 days after injury, and then, after a lapse of 4 days, for 11 days more. Satisfactory blood levels of the drug were obtained. In one case, therefore, considerable treatment with sulfadiazine did not prevent the later development of sympathetic ophthalmia.

Recapitulation: Sympathetic ophthalmia is proved to have occurred in 2 of the 159 cases of perforating ocular injuries in which enucleation was delayed long enough for the disease to develop, and almost certainly was present in a third, an incidence of 1.9 percent. Prompt removal of the sympathicogenic eye in two cases was followed by recovery of the sympathizing eye. In the third case, in a Negro youth, both eyes recovered.

(10) *Intraocular foreign body.* No attempt is made in this report to study the diverse problems of the intraocular foreign body. The 25 instances of this complication are included here merely to serve as a basis for estimating the influence of an intraocular foreign body on the chances for recovery from a perforating ocular injury.

In this series, of the 25 eyes with intraocular foreign bodies, 5, or 20 percent, recovered visual acuity of 20/100 or better, and 11, or 44 percent, lost all vision. On the basis of this small number, it would appear that the presence of a foreign body has an unfavorable influence on the chances for recovery.

The causes of failure among these 25 eyes are as follows: In 14 instances, the intraocular foreign bodies were success-

\* Burky, E. L., and Henton, H. C. Staphylococcus toxin combined with lens extract as a desensitizing agent in individuals with a cutaneous sensitivity to lens extract. *Amer. Jour. Ophth.*, 1936, v. 19, pp. 782-785.

fully removed; 3 of these eyes recovered visual acuity of 20/100 or better. The causes of reduction of vision in the remaining 11 (or the findings after enucleation) are intraocular infection (3 cases), nonspecific uveitis (4 cases), capsular remains (2 cases), phthisis bulbi (1 case), and uncertain (1 case).

In 11 instances, the intraocular foreign bodies were not removed. Two of these eyes recovered visual acuity of 20/100 or better. In the nine cases which did not recover useful vision, nonspecific uveitis was responsible for failure in three instances, major intraocular hemorrhage in four, infection in one, and phthisis bulbi in one. In five of these eyes, the presence of the intraocular foreign body was not diagnosed clinically and was found only on histologic section. Two of the foreign bodies were cilia.

Recapitulation: Intraocular foreign bodies appear to have an unfavorable influence on the chances for recovery from perforating ocular injuries. The incidence of posttraumatic uveitis is high among these cases, but here the evidence for a cause-and-effect relationship is unsatisfactory.

#### THE MANAGEMENT OF PERFORATING OCULAR INJURIES

From the foregoing study, what information is there that may be useful in improving the outlook for recovery from perforating ocular injuries?

The most important decision to be made in the management of a perforating ocular injury is whether to proceed with an attempt at repair, or whether to perform enucleation immediately. This decision will be based largely upon an estimation of the statistical chances that treatment will result in recovery in the case under consideration.

If the estimation of the chances for recovery could be brought to perfect ac-

curacy then the ideal goal of saving every possible injured eye with a maximum of efficiency would be achieved. It is fitting, therefore, to marshal the information made available in the earlier parts of this report, and to sort the various situations and complications of perforating ocular injuries into two classes: those that are reliable as prognostic signs, and those that are unreliable.

All the prognostic signs are on the negative side. No departure from the normal after traumatism is favorable. What must be determined is which abnormalities are usually reparable and which others are usually not.

The following points have been found to have a reasonably consistent adverse influence on recovery from perforating ocular injuries: (1) Injuries by blunt objects, including bullets. Injuries by very sharp instruments are much more likely to heal satisfactorily. (2) Double perforation of the globe; these may often be diagnosed by roentgenologic demonstration of the foreign body in the orbit. (3) Severe degrees of prolapse of intraocular contents; prolapse of combinations of vitreous, retina, choroid, and lens are almost always associated with irreparable disorganization. (4) Severe degrees of intraocular hemorrhage. The value of this sign is sometimes limited, since it is often impossible to distinguish between a small intraocular hemorrhage and a large one in an eye disrupted by injury. Careful transillumination may help to make the distinction. (5) Intraocular infection. Any degree of infection is seldom handled satisfactorily, even with the help of the sulfonamides, although newer chemotherapeutic agents may alter this situation. (6) The presence of an intraocular foreign body probably reduces the chances for satisfactory recovery.

The following signs, in contrast to the above, are unreliable as prognostic

guides: (1) The location of the laceration. (2) The length of the laceration; by itself this sign is of little importance, however it may imply the occurrence of two unfavorable complications—severe hemorrhage and severe prolapse. (3) Traumatic cataract in itself is not a reliable prognostic guide, although it may favor the occurrence of infection and of uveitis. (4) Small degrees of prolapse, especially prolapse of iris. (5) Minor degrees of hemorrhage.

It must be pointed out that these remarks concerning the role of the location of the injury are not meant to dispute the familiar statistical evidence that sympathetic ophthalmia occurs more frequently in wounds of the ciliary body. What is meant is that when confronted by a fresh ocular injury, the surgeon's estimate of the chances for uneventful healing should be little influenced by the location of the laceration. However, later on, if healing fails to proceed satisfactorily, the presence of a wound in the ciliary body should have considerable influence in the choice of management.

A summary of the relative prognostic merits of the various complications is given in table 15. It is from such signs that the surgeon must decide whether enucleation is indicated, or whether it is worthwhile to proceed with attempts at repair.

If it is decided to proceed with attempts to repair an eye that has received a perforating injury, a choice must be made from among several possible methods of surgical attack. For the repair of corneal lacerations, there are two principal methods: The use of direct corneal sutures or of a conjunctival flap. In an effort to determine the relative merits of these and other methods of repair, the cases in this report have been analyzed in respect to the type of surgical treatment given.

The various surgical approaches in cases of corneal laceration fall into four groups: (1) No surgical interference, treatment consisting of atropine and pressure bandages; (2) simple conjunctival flap, after debridement of the wound and iridectomy; (3) corneal sutures, after debridement and iridectomy; (4) a combination of corneal sutures and conjunctival flap with debridement and iridectomy.

TABLE 15  
PROGNOSTIC SIGNS IN PERFORATING  
OCULAR INJURIES

Factors Almost Always Associated with Failure:	Factors with no Consistent Relation to the Final Outcome:
Injury by a blunt object	Location of the perforation
Double perforation of the globe	Length of the laceration
Intraocular infection	Prolapse of iris
Severe degrees of prolapse of intraocular contents	Injury to the lens
Severe intraocular hemorrhage	Minor intraocular hemorrhage

In the study of the relative merits of each of these four methods, the discussion applies only to corneal lacerations, penetrating injuries not involving the cornea being excluded from this part of the analysis. Moreover, all cases demonstrated to be complicated by intraocular infection were likewise excluded, since this complication introduces another variable not clearly related to the type of surgical treatment. For similar reasons, cases with retained intraocular foreign bodies were excluded. After these exclusions, there remained a series of 109 eyes having corneal or corneoscleral lacerations, not infected, without retained intraocular foreign bodies, which were treated by one of the four methods given above (table 16).

Since it is important to learn if a division according to the surgical manage-



ment results in groups that are comparable, the data as to the incidence of prolapse and of damage to the lens and the average length of the laceration are given as indices of the severity of the injury. Thus in group 1, wherein treatment consisted of atropine and pressure bandage only, the injuries were shorter, there was a less frequent incidence of prolapse, although the incidence of damage to the lens was high. Moreover, most of the

haps demonstrate that for small lacerations without prolapse nonoperative treatment is as adequate as in direct surgical repair for more serious injuries. That none of the eyes receiving nonoperative treatment required enucleation is probably a further reflection of the relatively minor nature of the injury, and there is no evident reason for attributing the superiority in this respect to the treatment.

In the remaining groups, there is a rea-

TABLE 16  
INFLUENCE OF THE TYPE OF SURGICAL TREATMENT ON THE FINAL VISUAL ACUITY\*

Type of Repair	Average Length mm.	Iris Prolapse percent	Lens Injury percent	Final Corrected Visual Acuity			Break-down of Wound percent
				20/100 or Better percent	Worse than 20/100 percent	Blind percent	
I No repair, 22 cases	4.0	14	59	77	23	—	—
II Corneal sutures, 21 cases	5.2	71	19	81	9.5	9.5	24
III Sutures and flap, 17 cases	7.0	88	41	65	23	12	6
Average of II and III, 38 cases	6.0	78	29	73.5	16	10.5	16
IV Flap only, 39 cases	4.8	85	38	51	28	21	13

\* Corneal and corneo-scleral lacerations, excluding cases complicated by infection or by intraocular foreign bodies.

lacerations in group 1 were of 1, 2, or 3 mm. in length, the average being raised by three cases in which the laceration measured 9 mm. or over. In almost all of these there was spontaneous coaptation of the wound. That prolapsed iris was left in any instance is accounted for by the fact that the definition of iris prolapse used in this paper includes any case wherein iris tissue was present between the lips of the wound, although there may have been no actual protrusion.

Thus, the first group of cases, in which no operative treatment was undertaken, is not comparable with the other groups. The results achieved in this group per-

sonable degree of uniformity in the average amount of damage sustained. One situation helps to make the remaining groups similar and comparable. In the earlier days of the Wilmer Institute, it was the practice to repair all corneal lacerations by means of a conjunctival flap, and corneal sutures were rarely used. In the last few years, this attitude has been almost directly reversed, and nearly every eye needing repair has been treated with corneal sutures, at times supplemented by a conjunctival flap. Thus there are two groups of cases in which all random influences could operate equally, and in which the decision as to the technique

of surgical repair was influenced almost solely by the prevalent custom.

There were 39 lacerations that were repaired by a conjunctival flap, usually after iridectomy. Fifty-one percent of the eyes involved regained a corrected visual acuity of 20/100 or better, while 21 percent ended with loss of all light perception.

There were 38 cases which were repaired by the use of corneal sutures, in 17 of which a conjunctival flap was used in addition to the corneal sutures. In this group, 73.5 percent of the eyes regained a final corrected visual acuity of 20/100 or better, and 10.5 percent were blind.

The incidence of breakdown of the wound for each group is also given in table 16. Under breakdown is included delayed re-formation of the anterior chamber of over four days' duration, or loss of the anterior chamber after re-formation, as well as actual gaping of the wound with or without prolapse. The incidence of breakdown is high in those cases in which corneal sutures alone were used. Here the incidence of breakdown is increased because of a few cases in which the anterior chamber was temporarily lost on removal of the sutures. Where a conjunctival flap alone was used, the incidence of breakdown was 13 percent, and where both corneal sutures and conjunctival flap were used, the incidence of breakdown was 6 percent. While the incidence of breakdown appears to be inversely proportional to the apparent watertightness of the repair, the numbers involved are small and not significant.

The apparent advantage of corneal sutures over a simple conjunctival flap must be viewed with caution. From the statistical standpoint the observed difference in the two groups is barely significant. While the groups appear to be more or less similar, there are many possible ran-

dom influences which might not have occurred with uniform frequency in two groups of this limited size.

On the basis of the foregoing analysis there appears to be no distinct advantage of one method of repair over another, on the average, although one may be superior to the other in a particular case (see below).

With the foregoing evidence in hand regarding the importance of various complications and the relative merits of the various types of surgical repair, what generalizations can be made as guides in the treatment of perforating ocular injuries? The following suggestions, while not original, are familiar methods, with occasional modifications suggested by the analysis of these 172 cases.

In the first place, the usefulness of non-operative management should be kept constantly in mind. Table 16 demonstrates that many corneal wounds which coapt spontaneously, without prolapse, are seen to heal readily under nonoperative treatment. Where such treatment can be used, it is ideal. It should not be applied when there is any material between the lips of the wound, or any gaping of the wound, since these situations tend to increase the inflammatory reaction and the amount of scarring and may delay healing. Whenever surgical debridement of the wound is necessary, closure should be effected. It goes almost without saying that before surgery is undertaken in a perforating ocular injury most careful attention should be given to the possibility of an intraocular foreign body. Even when this complication seems unlikely, it should be investigated thoroughly in the history, in the clinical examination, and (ideally) by routine roentgenologic examination.

In proceeding with the surgical treatment of corneal or corneoscleral wounds, the first consideration is debridement of

the wound. Since there is evidence that prolapse of iris may prevent the development of infection, iridectomy should always be deferred until the time of repair of the wound and other measures of protection against infection are available. Iridectomy is the wisest method for reduction of a prolapse of iris, even though it may sometimes be tempting to try to reposit a prolapsed but otherwise intact iris. The complications to be feared from the latter course are intraocular infection and recurrence of the prolapse as the aqueous is re-formed. Besides iris tissue all other material and foreign bodies should be removed from the wound and pieces of cilia should be carefully sought.

The removal of blood clots from the anterior chamber is most desirable in view of the adverse effect of a clot which organizes instead of becoming absorbed. Moreover, during surgical repair, if fresh bleeding occurs, the wound should never be closed until the bleeding stops and the hemorrhage is evacuated.

The question of the management of the complication of a traumatic cataract arises at this point. Since traumatic cataract often favors the development of more serious complications, and at best requires a second operative procedure, it is wise to remove the cataract by lavage or piece by piece at the time of repair of the injury, *provided* that the cataract is sufficiently developed so that it is susceptible of reasonably complete removal, and provided that removal can be accomplished without serious risk of aggravating hemorrhage or prolapse. Unless these provisions are met, treatment of the traumatic cataract should be deferred for several months.

For closure of a corneal or corneoscleral wound, the choice of corneal sutures versus a conjunctival flap will be based on the sum and average of the fol-

lowing factors: First, the degree of gaping of the wound. A conjunctival flap does not appear to be reasonable treatment if the wound is gaping under the flap. Healing will occur with a smaller scar if the wound edges are approximated with sutures. Secondly, the raggedness of the wound and the degree of maceration of tissue. If the wound edges are macerated or very much softened by early reaction, sutures are impractical, and the defect heals best with a conjunctival flap over it. Third, the degree of damage to the lens. If the lens is intact, it may be considered that the placing of corneal sutures affords an unnecessary hazard in operative traumatic cataract. Fourth, the location of the laceration. If a conjunctival flap should adhere to a central corneal wound, the resulting leukoma would be greater than if the wound were closed with sutures; the sutures need not be placed directly in the course of the visual axis, but on one or both sides of it. Fifth, the unruliness of the patient. Where poor postoperative coöperation is expected, the tighter the closure of the wound the better. On the other hand, in children, removal of corneal sutures may necessitate a second anesthesia, which is avoided by the use of a conjunctival flap with absorbable sutures, or with silk sutures which quickly cut their way out spontaneously.

When corneal sutures are used, the simplest sutures are probably the best. The cornea is usually sufficiently tough so that simple sutures give adequate closure without danger of tearing out. Simple single sutures give the least amount of scarring. They should not penetrate Descemet's membrane, but should pass in mid-stroma, to reduce the chances of temporary fistula formation on removal. Silk corneal sutures can be removed after 9 to 12 days. After closure of the wound.

the injection of air or saline in the anterior chamber is sometimes useful to prevent the formation of anterior synechiae. The use of air is preferable, since it is retained more readily. All corneal lacerations should be dressed with a firm pressure bandage.

Scleral wounds are closed if necessary with simple direct silk sutures which may be buried or may be tied outside the conjunctiva. Nonchromatized absorbable sutures are, perhaps, preferable. Such injuries are relatively rare. Theoretically they should be associated with an increased incidence of retinal separation; for this reason, the use of a few diathermy punctures about the wound may be advisable.

Nonoperative procedures are similar to those used in conjunction with other phases of ophthalmic surgery. Atropine is almost always indicated postoperatively. The "prophylactic" use of sulfathiazol or sulfadiazine in all cases is probably wise, since about one in every seven eyes with a perforating injury is lost through infection. Although statistical proof of the value of this procedure is lacking, there is reason to believe that in some cases it may be of value. The good results from artificially induced fever for the treatment of postoperative iritis is well recognized. This procedure, moreover, is occasionally used as a "prophylactic" measure before the development of the uveitis. Since the relationship between injury to the lens and post-traumatic uveitis is so striking, the prophylactic use of artificial-fever therapy

should be reserved for cases complicated by traumatic cataract.

When uveitis develops in the presence of a traumatic cataract, the possibility of uveitis phaco-anaphylactica should be investigated, and can be demonstrated by an abnormal skin reaction on the intra-dermal injection of lens protein. If this diagnosis is established, treatment with lens protein and staphylococcus toxin may lead to recovery.

#### SUMMARY

In an analysis of 172 cases of perforating ocular injuries, the following factors are seen to have a reasonably consistent unfavorable influence on the chances for recovery: (1) Injuries by blunt objects; (2) double perforation of the globe; (3) severe degrees of prolapse of intraocular contents; (4) severe intraocular hemorrhage; and (5) intraocular infection. On the other hand, recovery is not consistently influenced by (1) the length of the laceration; (2) the location of the laceration; (3) injury to the lens; (4) prolapse of iris, and (5) minor degrees of hemorrhage. The interrelationship of some of these complications is discussed. The (corrected) incidence of sympathetic ophthalmia among these cases is 1.45 percent.

In the choice of methods of repair of corneal lacerations, the use of a conjunctival flap, or the use of direct corneal sutures appears to be about equally efficacious. Other features in the management of perforating ocular injuries are discussed.

# TRACHOMA VIRUS AND THE MORPHOLOGY OF INCLUSION BODIES\*

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The inclusion bodies found in trachoma may have an etiologic link with the virus that is assumed to cause the disease. Many attempts have been made to establish this view but two important difficulties stand in the way: inclusion bodies that are microscopically indistinguishable from those found in trachoma are found in other conjunctival diseases, and the virus has not been produced in culture. The bodies are found in both recent and long-standing cases of trachoma, with a frequency that increases with the care and experience of the investigator. A negative report has no value unless scrapings are examined from several areas of the fornix and both the palpebral and the bulbar conjunctiva. Much misunderstanding has arisen from the inadequate illustrations that have appeared. Even the best photomicrographs are disappointing compared with carefully executed drawings.

Towards the end of the last war I published some illustrations of the great polymorphism that may be found in these bodies (plate 2, frontispiece). Preparations made from epithelial scrapings present appearances that differ from those made from conjunctival sections. The superficial epithelial cells of the conjunctiva are probably the starting point for the infection of the deeper tissue. Consequently, great attention has been paid to them to the neglect of the deeper layers. In these superficial cells the inclusion bodies may be found sitting like a cap on the nucleus, although some may lie

free in the plasma. They may differ in size and intensity of staining. In size their elements may vary from  $0.25\mu$  to nearly  $1.0\mu$  in diameter, and a clear halo may surround them. In plate 1 the blue-stained bodies can be seen to vary in shape very considerably; "cocci," barrels, double "cocci," rings, dumb-bells and hour-glasses may be present. The whole cell may be full of these bodies and the wall may burst, thus liberating them. Such open cells may be seen in both scrapings and in sections. They are probably not due to artifact but actually occur in life. It may be that these small elementary bodies are the actual virus elements which are distinguishable from the larger initial bodies.\*

In two cases of traumatic conjunctivitis I suspected infection with trachoma. Epithelial smears were taken daily from the third day after the accidents. The findings were negative until the sixth day when intracellular elementary bodies and all shapes of initial bodies were found in many epithelial cells. These elements were present in increasing number on the ninth day and the first typical inclusion bodies were found on the fifteenth. They were few in number and stained lightly. Both these patients later developed classical trachoma, with many typical inclusion bodies. The disease finally subsided after some months of energetic mechanical treatment. The impression gained is that the elementary bodies intrude upon the cell from without, develop into the initial body, and by the multiplication of the latter the characteristic inclusion

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\* The cells shown in the illustrations were drawn for me by Mr. Zovetti.

bodies are formed. If this speculation is correct it follows that both initial and elementary bodies may be found in the cells without any inclusion bodies. The aforementioned cases would give support to this view.

Trachoma is not a disease restricted to the epithelium. The principal pathologic reaction is seen in the submucosa, where large masses of lymphocytes, plasma cells, and fibroblasts infiltrate the tissues. Deep scarring may shorten the conjunctival fornix, and the infiltrated tarsal plate may be distorted. These well-known clinical facts suggest that the infective process penetrates deeply into the tissues. In a report to the International Ophthalmological Congress in Egypt, Wilson (1937) stated that "true inclusion bodies, which one finds in the epithelial cells of the conjunctiva, are not found within the trachomatous follicle." On the other hand, subepithelial caps of extremely small Giemsa-staining elementary bodies (*rickettsia*) were reported by Cuénod and Nataf (1935, 1936, and 1937). They have been found in smears from the contents of trachoma follicles. Cuénod stated that they were "not common mast-cells, but cells filled with parasites."

I prepared paraffin sections from the conjunctiva of the fornix derived from 23 cases of trachoma. Moreover, I was able to study four excised trachomatous tarsal plates histologically. For two of them I am indebted to MacCallan. I acknowledge gratefully his kindness. The sections were stained with hematoxylin and eosin, van Gieson, Unna-Pappenheim, and Giemsa stains. In a certain number of sections both Victoria blue and polychrome methylene-blue stains were used. In areas where typical inclusion bodies were found in the superficial layers the underlying tissue was carefully examined. The inclusion bodies were situated in nests (figs. 4a, 4b) in the

superficial epithelial layers, mostly in groups of 30 to 50, surrounded by epithelium free from inclusion bodies. They differed from those found in the smear preparations in that most of them lie within delicate cystlike compartments. The "initial bodies" did not vary in shape to the same extent as in the smear preparations. The elementary and initial bodies could be distinguished only by the size of the granules. The smaller compartments contained 2 to 5 units whilst the largest might contain 30 to 40. The number appeared to be conditioned by the size of the balloonlike spaces. This cystlike appearance can be seen most easily with Giemsa staining, being but rarely visible when hematoxylin and eosin were used.

No such cystlike compartments were found in the deeper epithelial layers. But inclusion bodies may be present as deep as the basal epithelial cells. These corpuscles are freely imbedded in the epithelial layer, and the halo seen in the superficial layers or that of the smear preparations is absent. This halo is assumed to be a jellylike mucous substance (van Rooyen and Rhodes, 1940). The nucleus of the invaded cell may be displaced by the bodies; sometimes the whole plasma may be occupied by inclusions and no nucleus can be seen. Polymorphonuclear leucocytes migrating through the epithelium did not contain any inclusion bodies or Giemsa-staining granules (figs. 4c-8d).

In all advanced cases the submucosa contains numerous follicles, many of them forming densely infiltrated areas. These follicles consist of lymphocytes, plasma cells, leucocytes, and fibroblasts. Basophilic mast cells were found frequently in the less densely infiltrated reticulum (plate 5). Some of these cells displayed a typical wheel-shaped nucleus, others were reticulum cells with large,

pale nuclei and very little chromatin. The cells of fibroblast (histiocytes) type were frequently packed with blue and purple granules. Sometimes granules of both colors were found in the same cell. These granules may also lie in heaps free in the tissue and small groups may be seen without any relation to cells. Serial sections stained alternatively with Giemsa and hematoxylin were examined, and no basophil granules were found in the latter. Under high magnification ( $\times 1,350$ ) reticulum cells full of delicate elements showing both metachromatic and blue staining were seen frequently in the same field. Others showed a cytoplasm full of corpuscles with considerable variation in size (fig. 8c).

Sections prepared from the tarsal plate that had been excised from long-standing cases of trachoma were examined by the aforescribed methods. The whole tarsal plate was filled more or less with reticulum cells choked with dark blue or purple elements stained with Giemsa; thin fibroblasts were seen to be filled with blue or purplish granules; and many round elements were seen free in the tissues. Sometimes chains were formed like small streptococci. Similar appearances were present in the submucosa of the bulbar conjunctiva (figs. 9-10).

Slides were prepared from two cases

of follicular catarrh, and from acute and chronic conjunctivitis. No epithelial inclusions were found from scrapings in any of these, but basophilic mast cells were frequent in the sections of follicular catarrh. The granules of these cells could not be distinguished from those occurring in the trachoma cases.

### DISCUSSION

The morphologic appearance of the various types of epithelial inclusions strongly suggest that they are the virus elements. The differences between the appearances in scrapings and in sections may be due to the technique employed. I cannot explain the reason of this difference nor why the colonies in the deeper epithelial cell rows do not show the cyst-like appearance found in the superficial layers. The nestlike localization of the inclusion bodies indicates the need for most exhaustive examination of the sections. It often happened that a negative section was found to be positive after repeated scrutiny. The difficulties increase when a search is made for intraplasmatic single elements in the deeper tissues which may be quite obvious in epithelial scrapings. Only the colonies can be recognized in sections without difficulties.

I imagine that the series of events is

#### Plate 5 (Loewenstein).

Fig. 4b. Fornix region. Old case of trachoma. Superficial epithelial row with encapsulated virus colonies. The deeper cell rows contain colonies without haloes. Giemsa staining,  $\times 675$ .

Fig. 4c. The same section, basal epithelial row with subepithelial tissue. One inclusion body in the epithelial cell row; two reticulum cells filled with Giemsa-blue granula.

Fig. 5a. Case of old trachoma. Intraepithelial "mast cell" surrounded by virus-infected epithelial cells. Giemsa staining,  $\times 1350$ .

Fig. 6. Case of trachoma from the fornix region. Inclusion bodies in superficial epithelial cells only; polymorphonuclear leucocytes entirely free from virus elements. Giemsa staining,  $\times 1350$ .

Fig. 8a. Case of trachoma. Purplish granula in reticulum cells. Giemsa staining,  $\times 675$ .

Fig. 8b. Case of old trachoma. Basic layer of epithelium (a). Reticulum cells in submucosa filled with granula partially blue, partially purple. Giemsa staining,  $\times 1350$ .

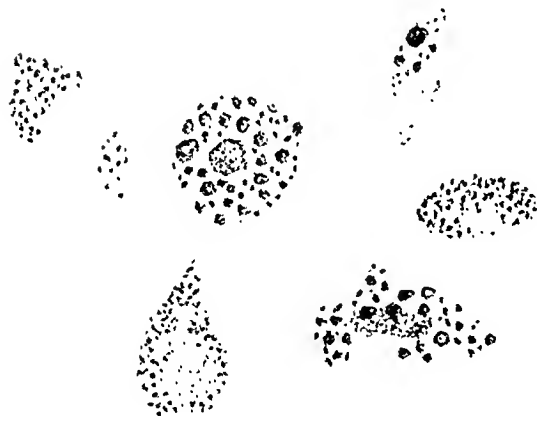
Fig. 8c. Case of trachoma, fornix region, from different fields. Mast-cell granula very large, metachromatic. Other cells contain metachromatic corpuscles also, but much smaller. Variant size of metachroic granula. Giemsa staining,  $\times 1350$ .



8a



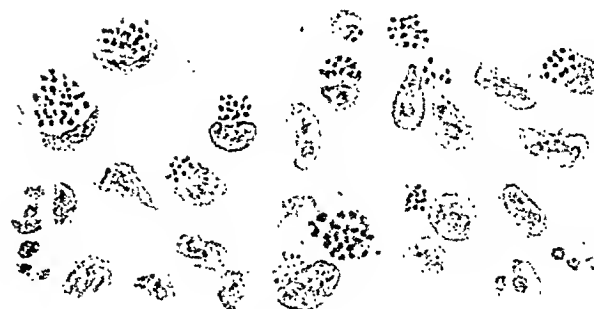
5a



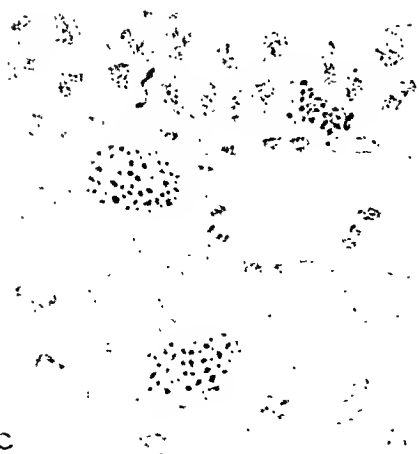
8c



8b



4b

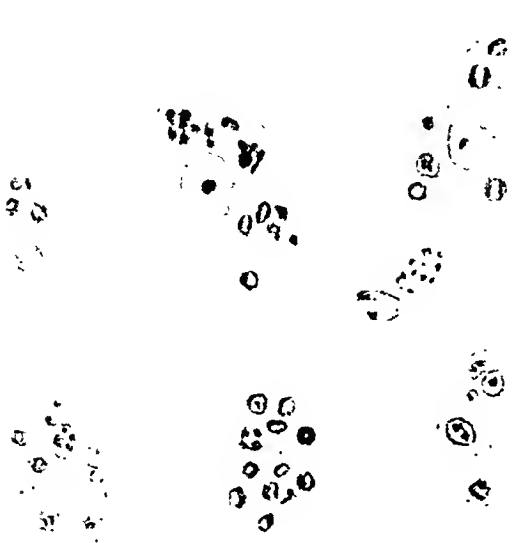


4c



6





10



9b



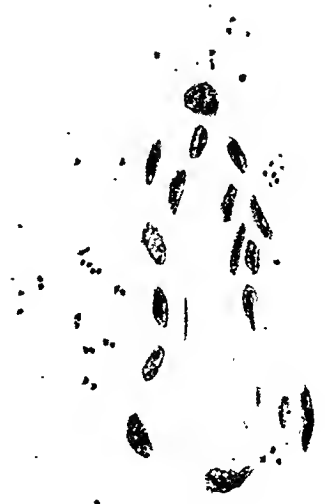
5b



8d



9a



9c

somewhat as follows: The virus invades the superficial epithelial cells of the conjunctiva where its elements grow into colonies, the inclusion bodies. The virus elements are carried into the deeper epithelial layers by the lymph stream and

present from the earliest stage (Birch-Hirschfeld, 1938), may act as phagocytes by reabsorbing the virus, although unable to destroy it. The subsequent development of fibrous tissue thus leads to the deep storage of infective material.

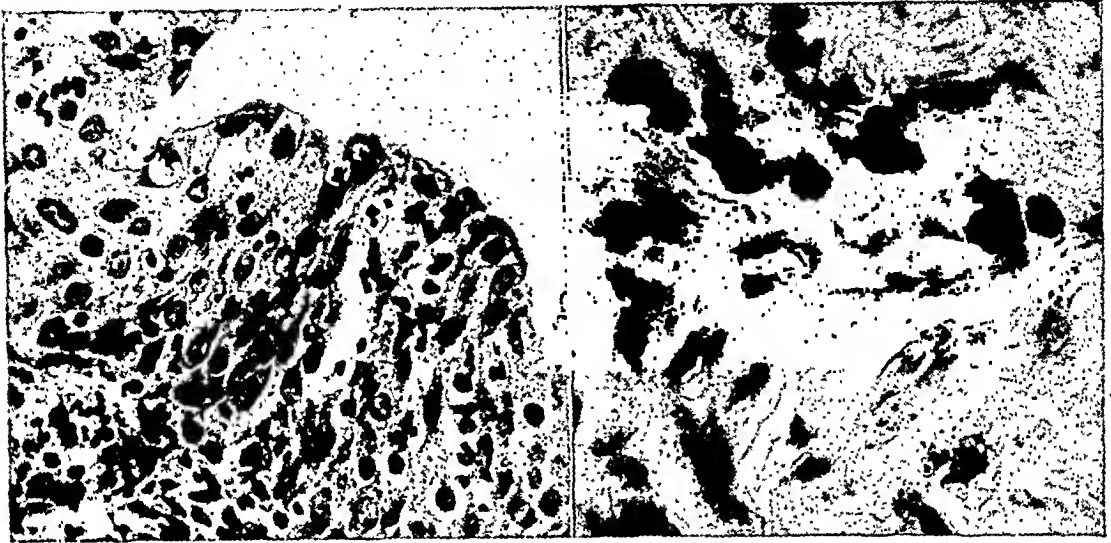


Fig. 4a

Fig. 7

Fig. 4a (Loewenstein). Inclusion bodies in superficial epithelial row from a case of trachoma. Giemsa staining,  $\times 675$ .

Fig. 7 (Loewenstein). Case of trachoma, section of the submucosa. Reticulum cells full of basophil granula. Giemsa staining,  $\times 1350$ .

reach the subepithelial tissue. At that level a follicular growth is produced, analogous to that found in lymphatic leukemic tumors. The interaction between virus and tissue conditions the production of follicles and the predominantly lymphocytic growth. The fibroblasts, which are

This may account for the frequent relapses in cases of long-standing trachoma. It is another reason justifying the excision of the tarsal plate in such cases.

Reticulum cells with round granules staining with Giemsa were observed in two cases of follicular catarrh. Certain

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Plate 6 (Loewenstein).

Fig. 5b. Case of trachoma. Intraepithelial virus; elements without halo. Giemsa staining,  $\times 1350$ .

Fig. 8d. Case of trachoma. Reticulum beneath follicular infiltration; six "mast cells" in one field. Giemsa staining,  $\times 675$ .

Fig. 9a. Case of trachoma, tarsal section. Center of the excised tissue reticulum. Cells filled with initial bodies and elementary corpuscles (granula?). Giemsa staining,  $\times 675$ .

Fig. 9b. Tarsus. Reticulum cells full of initial bodies (basophil granula?). Giemsa staining,  $\times 675$ .

Fig. 9c. From center of tarsus. Basophil granula; initial bodies (?) in reticulum cells surrounding a vessel. Giemsa staining,  $\times 1350$ .

Fig. 10. Case of old trachoma. Contents of follicle. Four "Leber" cells from different fields surrounded mostly by plasma cells. The two cells on the extreme left (upper and lower) are hematoxylin and eosin stained. Giemsa staining,  $\times 675$ .

forms of this condition are infectious and may be due to a virus, although visible epithelial inclusion bodies have not been seen so far. I have seen similar reticulum cells filled with Giemsa blue granules in pemphigus of the conjunctiva, although no inclusion bodies were found in conjunctival scrapings. The virus nature of this conjunctival disease was discussed by Gallardo and Hardy (1943). *Molluscum contagiosum* is considered to be a virus disease also (Lip-schütz, 1913), and follicles of a similar type to those of trachoma are found in this disease.

The whole problem of the nature of inclusion bodies in these conditions calls for much further investigation. The present observations remain inconclusive. There is not more than a probability that both the intraplasmatic Giemsa-staining elements in the reticulum cells and the extracellular ones are the virus itself.

#### SUMMARY

In advanced trachoma the follicles consist of lymphocytes, plasma cells, fibroblasts, and macrophages [cytrophages (Marchand)]. The last may be very large and contain half digested cells, remains of erythrocytes, splinters of nuclei, but no granules suggesting inclusion bodies. The cell remnants stain with both Giemsa and hematoxylin. The caps reported by Cuénod in the cells of the follicles were not found in any of the 23 cases of advanced trachoma which form the basis of this histologic investigation. Metachromatic granules, rather indistinct and cloudy, were found in plasma

cells having a typical wheel-shaped nucleus.

The appearance of the inclusion bodies differs in scrapings and in sections. In the scrapings they show considerable polymorphy, and individual elementary and initial bodies may be found alone in the cells.

In sections, encapsulated inclusion bodies with many Giemsa-staining elements are found in the superficial epithelial layers. In the middle layers the encapsulated inclusions tended to be smaller, with fewer elements. Groups of elements lying free in the epithelial plasma without either capsule or halo may be the virus itself as well. No encapsulated colonies were seen in the deepest layers of the epithelium. In the middle and deepest epithelial layers single reticulum cells full of metachromatic granules were present.

In the subepithelial tissues, reticulum cells of fibroblast character were filled with blue and purple granules. The size varied, but many were equally sized and equal to that of the intraepithelial elements. Granules were free in the tissues, some single and others in colonies.

The diseased tarsus was found to be full of reticulum cells of fibroblast character with blue and purplish elements in large numbers, both inside and outside the cells. Similar granules were not found either in the lymphocytes or in the plasma cells.

It is possible that both the intraplasmatic Giemsa-staining elements in the reticulum cells and the extracellular elements are the virus itself.

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## IODIDE THERAPY FOR SENILE MACULAR DEGENERATION\*

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In 1885 Haab<sup>1</sup> described the condition which we know as senile macular degeneration. De Schweinitz<sup>2</sup> pronounced this a loose term and classified it as a lesion or lesions which arise in senescence, at 50 years of age and older. His description of senile macular degeneration is a masterpiece:

In the very early stage the macular area may exhibit features which differ only slightly from those common to elderly people; a color darker than normal, a faintly muddy hue or a delicate mottling. Later, close focusing reveals a number of brownish black granules interspersed with others which are light colored. Occasionally there are white glistening dots which are often mistaken for Gunn's dots, with which they have nothing in common. In the macula are small yellowish white spots, interspersed with pigment dots and minute hemorrhages, or irregular shallow erosions, which may go on to atrophy of the elements and slight pigment heaping. The descriptive title, moth eaten macula has been applied. While it is true that in these early stages the visual disturbance is often out of all proportion to the inconspicuous pathological changes, it is also true that sometimes at this period, although sight is indistinct the vision is normal for the usual tests. It is generally maintained that treatment is unavailing. The prognosis of this condition is favorable in that it does not produce total blindness, but it is not influenced by any form of treatment.

Duke-Elder<sup>3</sup> agrees that treatment is extremely unsatisfactory. He believes the condition to be due essentially to proc-

esses outside medical control. Moreover, in all such cases we are dealing with tissues of low vitality which are in no condition to respond to therapeutic or stimulatory measures.

This prognosis leaves a patient with but little hope. It offers a sad outlook for the remainder of his allotted days, at the time when he is frequently limited in physical ability and needs his vision desperately to live with any degree of happiness. It is the purpose of this paper to hold out some hope to this type of patient.

Volumes have been written on sclerosis of the retina, while relatively little has appeared in print concerning sclerosis of the choroid. This discrepancy is due to the fact that the retina may usually be examined with the ophthalmoscope but the choroid only occasionally. H. Friedenwald,<sup>4</sup> J. S. Friedenwald,<sup>5</sup> de Schweinitz,<sup>2</sup> and H. Wagener<sup>6</sup> (among American authors) have contributed much to our knowledge of retinal sclerosis. It is believed that retinal sclerosis plays a negligible part in senile macular degeneration.

Duke-Elder,<sup>3</sup> in defining senile macular degeneration, writes that it is due to sclerosis and obliteration of the choriocapillaris. B. Rones<sup>7</sup> also is of this opinion. He states: "Obliteration of the choriocapillaris is of primary importance in producing the retinal changes. The pigment epithelium is an early sufferer from

\* Candidate's thesis accepted for membership in the American Ophthalmological Society, June, 1944.

this diminished circulation and its changes are partly of a proliferative and partly of a degenerative nature." Kondo<sup>8</sup> considered sclerosis of the choroidal vessels to be of cardinal importance in macular degeneration. The majority of writers agree with this explanation as the cause of senile macular degeneration.

J. S. Friedenwald<sup>9</sup> states that "Atheroma of the choroidal vessels does not manifest itself directly in any ophthalmoscopically visible change. This statement can be made with some assurance because the great majority of persons over 65 years of age have histologically demonstrable atheromatous changes in the choroidal vessels while only a small proportion exhibit these atrophic changes in the choroidal tissues which are attributed by clinicians to choroidal sclerosis. These atrophic lesions occur preëminently in the macular and peripapillary regions and in the extreme periphery of the fundus." Cohen<sup>9</sup> states, "Arteriosclerosis may exist in any of the intraocular vessels without clinical evidence of its presence elsewhere in the body." Friedenwald further states: "Until more definite evidence is available to show these atrophic lesions are directly connected with disease of the blood vessels, it seems best to classify them along with peripheral cystic degeneration of the retina and the pigment atrophy of the pupillary margin of the iris as senile rather than arteriosclerotic." That many authors are in agreement with this opinion is unquestioned.

A. Sorsby<sup>10</sup> and P. Waardenburg<sup>11</sup> have presented proof that some cases may be abiotrophic.

The pathologic changes have been investigated by Nagel,<sup>12</sup> Harms,<sup>13</sup> C. Behr,<sup>14</sup> J. S. Friedenwald,<sup>5</sup> and Rones.<sup>7</sup> Nagel was chiefly concerned with the yellowish white spots found about the posterior pole of the globe. He concluded that these spots were granules of calcium

carbonate in drusenlike thickenings located in the lamina elastica. Pigment granules were not found in such thickenings but always upon the surface of the smaller and entirely displaced only by the larger thickenings. He thought the impairment of vision was due to pressure of these thickenings upon the external layers of the retina. He does not mention the condition of the blood vessels.

Harms found the lesions confined to the pigment epithelium and neuroepithelial layer of the retina, with the choroid not involved. C. Behr confirmed the findings of Harms. He advanced the suggestion that senile macular disease should be regarded as a special type of hereditary degeneration, depending upon a congenital predisposition to premature death of the macular retinal neurons.

Friedenwald reports "In these cases the essential lesion seems to be in the choroid, and while it may occur at any point in the fundus, the point of election is at the macula. The choroidal capillaries here become obliterated and show hyalin degeneration. There is both atrophy and proliferation of the overlying retinal pigment epithelium, with the formation of many colloid excrescences on Bruch's membrane and some scattering and heaping up of pigment. The deeper layers of the retina which are dependent upon the choroidal capillaries for their nutrition become atrophied and disorganized; indeed, the atrophy may extend throughout the whole macular region."

Rones states:

Histologically it is evident in these cases that obliteration of the choriocapillaris is of primary importance in producing the retinal changes. The role played by the choriocapillaris in the nutrition of the retina is of the utmost importance, and consequently, any great impairment of its function must necessarily exercise a deleterious influence upon its dependent tissues. The pigment epithelium is an early sufferer from this diminished circulation, and its changes are partly of a proliferative and partly

of a degenerative nature. Many of the cells increase considerably in size, so that the layer loses its regular appearance. Though there is evidence of cellular division, many cells show signs of degeneration, with pale vacuolated nuclei. There is also considerable variation in the pigment content of the cells and many of them lose all of their pigment. The pigment granules do not have their normal rod form, but become small and round, and with the destruction of the cells are scattered over the basal membrane. In elderly people the choriocapillaris exhibits many caliber variations, some vessels being almost occluded while others exhibit compensatory dilatation. The arteries are also seen to vary in their caliber and their walls show definite thickening. Where an artery is found to be occluded, the entire zone of choriocapillaris which it feeds is found to be atrophied, while an adjacent zone may appear quite normal. It follows that atrophy of the capillary layer occurs in a very patchy manner.

In the earlier stages of senile macular degeneration the patient complains of a slight blurring of vision which persists after refraction. If the macula is carefully examined usually a slight disturbance of pigment or a paleness will be detected which may vary only slightly from the normal. Sclerosis of the retinal vessels may or may not be present at this time. In the cases reported here sclerosis was present in every instance. Later in the progress of the disease there is a minute dispersal or heaping of pigment which manifests itself as small light or small dark dots. Retinal sclerosis is nearly always present at this stage. Still later these pigment changes are conspicuous and in the end stages the macula is almost entirely destroyed, only a few small clumps of retinal cells remaining in this area. In any stage of these changes a macular hemorrhage may complicate the ophthalmoscopic picture and hasten the progress of destruction.

The vision may be impaired early in the disease when the fundus examination reveals a questionable variation from the normal fovea and when sclerosis of the retinal vessels is not marked. In certain

cases the vision may not be impaired until the macular changes are easily discernible. The impairment of vision may be out of all proportion to the ophthalmoscopic picture and again the vision may be surprisingly good where the damage to the fovea is extensive. In the latter instance the vision is nearly always diminished. In the later stages the vision is invariably poor.

The foveal changes can usually be seen in senile macular degeneration, so perimetry is not often employed. Traquair<sup>15</sup> states that even when minute retinal lesions are detected, the field defects often indicate a much larger area of functionally altered retina than is indicated by the ophthalmoscopic findings. In some instances, relative blue-yellow blindness may be present. At times the scotoma may be central and less than two degrees in diameter, whereas in other cases the field defects suggest homonymous or bitemporal hemianopic or quadrant-shaped scotomata. This may be the case without the presence of visible corresponding retinal lesions, for it is by no means always possible to correlate the field defects with the visible foveal changes. This discrepancy of findings is due to the patchy atrophy of the choriocapillaris described by Rones.

Senile macular degeneration is encountered in persons of middle age or beyond, who usually are in reasonably good health and actively engaged in some occupation. It is less often encountered in individuals with poor health. They frequently have a slight increase in systolic blood pressure and in many instances hypertension of a mild or severe degree may be present. These patients are frequently of a nervous temperament and some are apprehensive concerning the prognosis of their vision.

Iodine was first discovered by Bernard Courtois, a Parisian chemist, in 1811.

Since that time it has had a varied and interesting history. It has been prescribed for most of the ills of humanity at one time or another. Volumes have been written upon its various actions but despite this its hormone and alterative mysteries are not completely solved. There is considerable diversity of opinion among clinicians and experimental investigators with respect to its influence upon the circulation and the vascular system.

In 1914 Schwalbe<sup>10</sup> sent questionnaires to practitioners and clinicians. Their answers revealed an evident lack of agreement as to the action of iodide in arteriosclerosis, as well as to the favorable alterations and functional amelioration it induces, and finally its value as a symptomatic agent against subjective manifestations. In a review published in 1933, Liebig<sup>17</sup> was unable to report any recent observations from this angle.

Experimental investigations of the effect of iodine on the circulation have embraced mainly: (1) Its effect upon vascular caliber; (2) effect upon pathologic alterations of the vascular walls; (3) effect upon blood mass; and (4) effect upon viscosity of blood plasma.

In 1927, Guggenheimer and Fisher,<sup>18</sup> in experiments with animals, found that iodine produced vasodilation and fall in blood pressure, the best results being obtained with a dilution of 1:1-5 million. Freund and König<sup>19</sup> in 1928; Mancke in 1930;<sup>20</sup> Osterman<sup>21</sup> in 1930; and Barkan and Prikk<sup>22</sup> in the same year could not obtain these results with similar experimentation. Barkan and Prikk stated: "With regard to the circulation, the action of iodide has not as yet been clarified by experiment. In this and other respects it still remains a pharmacological problem."

Murata and Kataoka in 1917;<sup>23</sup> Liebig in 1931; Turner in 1933;<sup>24</sup> and Page and

Bernhard<sup>25</sup> in 1935, found that iodine in large doses prevented the occurrence of atheromatous vascular changes in rabbits fed with cholesterol. Attention was directed to the importance of the thyroid gland by Shapiro in 1927.<sup>26</sup> Turner and Khayat<sup>27</sup> in 1933, found that the presence of the thyroid gland is a prerequisite for the manifestation of this action of iodine. Murata and Kataoka determined that the presence of thyroxin was a factor in retarding these changes. This was corroborated by Turner in 1933, and by Friedland<sup>28</sup> in the same year.

Handousky<sup>29</sup> (1938) experimented by feeding dogs large amounts of pure vitamin D. No changes could be found in the arteries of the normal animal. Following removal of the thyroid and parathyroid severe sclerotic changes in the aorta as well as the pathologic picture of a nephrosclerosis ensued. If thyroxin was administered to the animals after the operation, simultaneously with the vitamin these aortal changes did not appear. Handousky concluded that a hyperfunction of the thyroid favors the occurrence of arteriolonecrosis and inhibits arteriosclerosis; a hypofunction inhibits arteriolosclerosis and favors the appearance of arteriosclerosis.

Kraus<sup>30</sup> (1935) found that 4-percent abrodil produced a maximal dilatation of intact vessels in the ear of a rabbit, although he tested concentrations as high as 40 percent. An interesting item is reported by Saglitzer, Demel, and colleagues<sup>31</sup> (1930-34). They injected urocelectan or abrodil for the purpose of arteriography in patients with severe arteriosclerotic disturbances of the extremities. Some of these patients were so improved by a single injection that they were able to resume their former occupations for periods up to three years. Nils Alwall<sup>32</sup> (1939) gives a very excellent

bibliography in a résumé of the iodide problem and adds the results of his experiments on plasma viscosity. He concludes that iodides have little or no effect on the plasma viscosity and suggests that iodides may exert their influence upon the pathologic changes of the vascular wall.

Many ophthalmologists are prescribing iodides in various forms but only a few have recorded their results in the literature. Pflüger<sup>33</sup> used iodine trichloride solution 1:3,000 to 1:2,000 for cases of acute infection and sodium iodide with sodium chloride for chronic cases. His method was to inject 2 to 4 gm. subconjunctivally, combined with paracentesis of the anterior chamber. He obtained spectacular results in various intraocular infections, progressive myopia, detachment of the retina, and central retinobulbaritis. Gallemacerts<sup>34</sup> injected potassium-iodide solutions subconjunctivally. Sourdille<sup>35</sup> and Panas<sup>36</sup> treated several types of choroiditis with pure iodine and solutions of potassium iodide; one injection every two to three days in conjunction with constant current, and reported excellent results in various conditions, and improvement in choroiditis macularis. Naegeli<sup>37</sup> studied the effect of subconjunctival employment of iodipin, recommended as a substitute for the iodides, on the eye of the rabbit. He found it well tolerated, although subcutaneous injections of slightly larger doses deposited approximately the same amounts of iodine in the various tissues of the eye. He considered the iodine to act as a very energetic agent of resorption, especially of pathologic substances.

Schiele<sup>38</sup> presents a comprehensive review of the history of the injections of sodium-iodide solutions. His preferred method was to inject 1 c.c. of 1:1,000 solution of sodium iodide to which three

drops of 1-percent aconitine (a local anesthetic) had been added.

Jensen<sup>39</sup> and Cowan and Jordan<sup>40</sup> inject Pregl's solution subconjunctivally for various ocular affections with good results.

E. Metzger<sup>41</sup> preferred 10 c.c. of 10-percent solution of sodium iodide given intravenously, and found that this was tolerated by patients who were sensitive to other preparations of iodide. He recommended daily injections in severe cases.

In the series of cases, reported by the present writer, oral administration was composed of protiodide of mercury in 0.125- to 0.25-gr. tablets thrice daily. If it was thought that this form of iodide would not be tolerated, either Lugol's solution or saturated potassium iodide was given. The dosage of the iodide solutions was gauged by the individual tolerances, and in no instance was a dosage of 20 drops thrice daily exceeded. The usual variations of tolerances were encountered. Some patients were able to take fairly large doses while others could not endure iodide in any form without severe gastric discomfort or the appearance of skin rash. Little difference was noted in the end results brought about by these three types of iodides. More than one half of the cases reported in this series improved on oral administration alone. This percentage would undoubtedly have been larger had all the cases been tried on this method but, for various reasons, some were given iodides by injection from the beginning of their treatment. Administration was continued as long as the vision improved and then was given on alternate months. It was discovered that in certain cases the vision, in a few months, would decrease if iodides were entirely discontinued.

Four different preparations of iodide for subcutaneous injection were admin-



TABLE 1

RESULTS OF IODINE MEDICATION FOR SENILE MACULAR DEGENERATION

Case No.	Age	Months Observed	Original Vision	Best Vision	Vision Last Seen	Medication	Complications
1	55	48	0.5	0.7	0.6	P	
2	55	48	0.4	0.7	0.6	P	
3	70	12	0.9	1.1	1.1	P	
4	68	13	0.2	0.8	0.8	P	
5	68	13	0.1	0.4	0.4	P	
6	66	24	0.07	0.2	0.1	I	
7	66	24	0.09	0.3	0.1	I	
8	67	21	0.3	0.5	0.4	L	
9	67	21	0.3	0.5	0.4	L	
10	65	21	0.04	0.9	0.9	P	PNH
11	81	24	0.1	0.2	0.2	K, P	
12	81	24	0.1	0.2	0.2	K, P	
13	66	36	0.5	0.7	0.5	P	
14	62	12	0.5	0.7	0.7	I	
15	62	12	0.1	0.6	0.6	I	FP
16	54	36	0.5	1.0	1.0	P	FP
17	54	36	0.4	0.9	0.8	P	PNH
18	65	23	0.6	0.8	0.5	P & I	PNH
19	65	23	0.4	0.4	0.2	P & I	
20	64	13	0.1	0.6	0.6	P	
21	56	3	0.8	0.9	0.9	P	
22	56	3	0.8	0.8	0.8	P	
23	64	61	0.5	0.8	0.8	P	
24	64	61	0.1	0.6	0.6	P	
25	61	37	0.7	0.9	0.9	K & P	
26	61	37	0.7	1.0	1.0	K & P	
27	61	26	0.9	1.2	1.1	P	
28	70	3	0.1	0.6	0.6	P	
29	70	3	0.1	0.6	0.6	P	
30	67	28	0.5	0.8	0.8	P	
31	67	28	0.9	1.0	1.0	P	
32	66	35	0.6	1.0	1.0	P	
33	66	35	0.2	0.2	light	P	CM
34	64	23	0.8	1.0	0.5	P	
35	64	27	0.2	1.1	1.1	P	
36	64	27	0.4	1.1	1.1	P	
37	62	7	0.3	1.1	0.6	P & I	CI
38	62	7	0.5	0.8	0.6	P & I	CI
39	70	3	0.8	1.2	1.2	I	
40	70	3	0.9	1.0	1.0	I	
41	75	2	0.4	0.7	0.7	L & I	
42	75	2	0.1	0.1	0.1	L & I	
43	67	9	0.4	0.6	0.5	P	
44	67	9	0.5	1.0	0.9	P	
45	62	3	0.9	1.2	1.2	P	
46	62	3	0.8	1.2	1.2	P	
47	68	2	0.5	0.6	0.6	I	
48	68	2	0.06	0.3	0.2	I	
49	54	25	0.4	0.6	0.6	L	
50	54	25	0.7	0.9	0.9	L	
51	61	1	0.5	0.8	0.8	P	
52	61	1	0.3	0.5	0.5	P	
53	70	1	0.5	0.5	0.5	P & I	
54	70	1	0.6	0.6	0.6	P & I	
55	62	9	0.4	0.4	0.2	P	
56	64	2	0.6	1.0	1.0	P	
57	64	2	0.6	1.0	1.0	P	FP
58	78	4	0.6	0.8	0.8	P	
59	62	1	0.9	1.2	1.2	P	
60	62	1	0.9	1.2	1.2	P	
61	66	1	0.5	0.8	0.8	I	
62	70	6	0.2	0.2	0.02	I	
63	70	6	0.2	0.2	0.1	I	

TABLE 1—*Continued*

Case No.	Age	Months Observed	Original Vision	Best Vision	Vision Last Seen	Medication	Complications
64	72	7	0.4	0.7	0.6	I	PNH
65	72	7	0.5	0.8	0.6	I	PNH
66	75	37	0.2	1.0	0.7	P & I	CI
67	75	37	0.2	1.1	0.8	P & I	CI
68	61	8	0.1	0.5	0.5	P	
69	66	6	0.5	0.7	0.7	P	
70	61	9	0.4	0.7	0.7	I	FP
71	61	9	0.1	0.2	0.2	I	
72	71	2	0.9	1.1	1.1	P	
73	71	2	0.6	0.8	0.8	P	
74	56	11	0.09	0.1	0.1	P & I	
75	56	11	0.03	0.1	0.1	P & I	
76	75	23	0.2	0.3	0.3	I	PNH
77	75	23	0.6	0.6	0.6	I	PNH
78	70	24	0.8	1.1	1.1	I	
79	52	30	0.3	1.0	1.0	P	
80	52	30	0.3	1.0	1.0	P	
81	80	1	0.4	0.6	0.6	P	FP
82	80	1	0.4	0.6	0.6	P	FP
83	71	16	0.1	0.3	0.3	P	
84	71	16	0.2	0.4	0.4	P	
85	80	4	0.1	1.1	1.1	I	
86	79	4	0.3	0.5	0.5	I	
87	79	4	0.1	0.3	0.3	I	
88	71	7	0.5	0.9	0.8	I	
89	71	7	0.6	1.0	0.9	I	
90	72	48	0.2	0.5	0.5	P & I	FP
91	72	48	0.2	0.5	0.5	P & I	FP
92	87	23	0.2	0.5	0.4	P	
93	71	25	0.6	0.6	0.4	K, P & I	
94	71	25	0.7	0.8	0.7	K, P & I	
95	73	5	0.3	0.5	0.5	L	
96	73	5	0.2	0.6	0.6	L	
97	74	1	0.5	1.0	1.0	I	
98	55	2	0.9	1.2	1.2	L	
99	78	16	0.7	0.9	0.9	I	
100	78	16	0.6	0.9	0.9	I	
101	70	48	0.4	0.9	0.9	P	
102	70	48	0.5	0.9	0.9	P	
103	73	1	0.4	1.2	1.2	I	
104	73	1	0.5	0.9	0.9	I	
105	71	1	0.3	0.3	0.2	L	
106	71	1	0.5	0.8	0.8	L	
107	75	62	0.7	1.1	1.1	L	
108	75	62	0.8	1.1	1.1	L	
109	82	2	0.7	0.9	0.9	P	
110	82	2	0.1	0.2	0.2	P	
111	68	4	0.4	1.1	1.1	P	
112	70	6	0.6	0.9	0.9	P	
113	67	2	0.8	1.0	1.0	I	
114	67	2	0.8	1.0	1.0	I	
115	69	24	0.7	1.1	1.1	P & I	

Abbreviations: P—protiodide of mercury  $\frac{1}{8}$ - to  $\frac{1}{4}$ -gr. doses; L—Lugol's solution; K—Potassium iodide; I—Subcutaneous injection of iodide; PNH—Pale nerve head; CI—Increase of lens opacities; CM—Cataract matured; FP—Fundus changes which could complicate the results obtained as listed in syllabus.

istered, each of which seemed equally effective. For this method 1 c.c. was injected subcutaneously twice or thrice weekly, so long as the vision continued to improve. When this point was reached

the injections were discontinued and oral administration as described above was given on alternate months. In a few cases it was necessary to give the injections on alternate months to maintain the im-

proved vision, for the vision would decrease when these patients were on oral administration.

Ten eyes improved when iodides were given by injection which had failed to show any improvement on oral administration.

In this series of 67 patients with a total of 115 eyes, which showed senile macular degeneration, the eldest was 87 years of age and the youngest was 52; the average age being 70.34 years. The longest any patient was under observation was five years, and the shortest period of observation was one month; the average time of observation was 15.13 months. The poorest original vision in this series was 0.03 and the vision of this eye increased to 0.1 under administration of 0.25 gr. of protiodide of mercury thrice daily. This vision was maintained for 11 months, when the patient was last seen. The most acute original vision included in this series was 0.9, and in these eyes foveal changes were present. Ten eyes were not improved by any method tried. Fifty-six eyes improved with oral administration. Ten eyes showed no change while under oral administration but did improve when iodides were injected subcutaneously. The average improvement of the 115 under treatment was 89 percent. The most marked improvement was from 0.04 to 0.9, which is 22.5 times the original vision. Subcutaneous injections were given in this case. In only 15 eyes were the lenses clear. In five eyes lens opacities increased appreciably while the patient was undergoing treatment, one cataract becoming mature. One eye had occlusion of two small branches of the inferior nasal artery and in another eye a small retinal hemorrhage was found adjacent to the macula. Seven discs showed a decreased capillarity. Two eyes had choroidal sclerosis and two showed scattered areas

of choroidal degeneration. All eyes had sclerosis of the retinal vessels to some degree and all had mild refractive errors with the exception of three aphakic eyes which required a high correction for compound hyperopic astigmatism. The vision in each instance was taken with the error of refraction corrected at that time.

It is interesting to note that 29 eyes showed a decrease in vision after the initial improvement. One of the 29 was under observation only two months (no. 48). Two eyes (no. 107 and 108) which were under observation 62 months did not show any decrease in vision.

An undetermined number of patients who were unable to read with the original vision but who could read with their improved vision, complained because they were able to read for short periods only.

Two cases are worthy of especial mention. The first was of a woman, aged 67 years, with incipient lens changes, moderate arterio- and arteriolar retinal sclerosis and stippled maculas, whose vision was 0.4 and 0.45. She was given protiodide of mercury, gr. 0.25 thrice daily, and three months later had attained a vision of 1.0 in each eye. At this time the medication was discontinued. Eight months later she reported with a vision of 0.2 in each eye and again protiodide of mercury, gr. 0.25 thrice daily, was prescribed. In three months her vision had increased to 1.1 and 1.2. She continued with this treatment and retained normal vision for two years, when the lens opacities increased, so that by the end of a third year her vision was 0.4 and 0.45. At this time the protiodide was discontinued and she was given 1 c.c. of camiol subcutaneously twice weekly. One month later her vision had improved to 0.75 and 0.7. She was not seen for six months when the vision had decreased to 0.55 and 0.45.

The second case was that of a man, aged 70 years, with incipient lens opacities, arterio- and arteriolar retinal sclerosis, and perceptible macular depigmentation, whose vision was 0.3 and 0.35. Protiodide of mercury, gr. 0.25 thrice daily, was prescribed, and his vision slowly decreased to 0.1 in each eye in 13 months. His cataracts had not increased and all fundus details could be seen perfectly. The protiodide was discontinued and 1 c.c. of homiodin was injected subcutaneously twice weekly. He was not see for six months, but the treatment was continued. When he was again examined the cataracts had increased so that fundus details were seen with difficulty. He insisted that his cataracts be removed. With considerable reluctance this was done. Following surgery his corrected vision was 1.1 in each eye. For the past three-and-one-half years he has taken protiodide, gr. 0.25 thrice daily, at irregular

intervals and his vision has varied from 1.1 to 0.9 in this space of time. When his vision decreases his medication is resumed, and each time his vision improves.

### CONCLUSIONS

1. The conditions which produce senile macular degeneration are thought to be: (a) Senility, (b) heredity, (c) sclerosis of the choriocapillaris of the choroid. It is probable that heredity is the major factor in many instances, for it may predispose to either senility or to sclerosis of the choriocapillaris.

2. The administration of iodides did appreciably improve the vision in a majority of cases of senile macular degeneration in this series.

3. The mechanism by which this improvement is obtained is not known.

4. Large doses of iodides are not necessary to obtain satisfactory results.

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# ERRORS IN DIAGNOSIS OF INTRAOCULAR TUMORS\*

(SUSPECTED OR REAL)

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It is always a pleasure or satisfaction to report our successes in the treatment of any eye disease or good results after operations upon the eye.

A writer in the *British Journal of Ophthalmology* (June, 1943) makes a very truthful statement: "We have always held the opinion that one learns more from failures, our own as well as others, than from successes" and also adds "It always pays to listen to a patient's history, even if it may be very diffuse and to note the salient points in the history."

These truths will be evident in the history of the following cases.

*Case 1.* Mr. "A," aged 58 years, came for consultation on January 29, 1932, with the history of gradual failure of vision in the left eye for five years, during which time he was under the care of another oculist, who pronounced his condition as simple detachment of the retina. *Ophthalmoscopic examination* revealed a large, gray, smoothly rounded mass projecting far forward into the vitreous in the upper outer quadrant. There was an extensive detachment of the retina surrounding this mass, more elevated than the detachment elsewhere. With the pupil dilated it was possible to see all around the mass, which was very light, almost white in color. Transillumination showed a definite shadow. A diagnosis of "tumor" was made, and enucleation advised, and, because its color indicated that it was only mildly malignant, a favorable

prognosis was given. The eye was promptly enucleated and the pathologist reported a spindle-cell sarcoma with very little pigment—evidently not a very malignant type. When the patient was seen in August, 1943, some 11 years later, he was perfectly well, so that he has probably passed the danger from any metastasis, and the mistake in diagnosis and delay in operation has had no serious result.

*Case 2.* Mr. "B," aged 55 years, was referred to us on July, 1943, with the history of sudden loss of vision in his right eye a week previously, and the request of information and advice concerning operation. He stated that 10 days previously, while working in his victory garden but doing no heavy lifting, he noticed the vision of this eye suddenly become blurred. *Examination* showed a large, smooth, rounded elevation in the upper portion of the fundus, sharply defined, with no folds, partly covering the nerve and entirely concealing the macula. The fundus was normal elsewhere. The elevation rose abruptly and was sharply defined on the temporal and nasal sides but had no sharp demarcation above—no retinal tear nor hole could be seen. Transillumination revealed no shadow. Tension was 14-16 mm. Hg (Schiotz); vision was the perception of hand movements. A small disc could be seen above and to the nasal side, but the field was blind at fixation and below. Our diagnosis was a probable serous detachment of the retina, and we advised that the patient be put to bed in the hospital with complete rest, in the hope that the detachment might flatten so that it might be possible

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to see the hole or tear if such existed and then operate.

In February, 1944, six months later, the doctor reported that he had put the patient to bed as suggested, and as the detachment did not subside, he had performed a coagulation operation, following which the retina became reattached and vision improved. Two months later a new detachment occurred on the medial side of the former area, and the entire retina became detached. Several months later the patient reported to the doctor with "absolute glaucoma," tension 140 mm. Hg (Schiotz). The eye was removed, and the pathologist found a "melanotic" sarcoma of the choroid near the optic nerve. This patient illustrates how impossible it may be in some cases to make a definite diagnosis of intraocular tumor in the very early stages.

*Case 3.* Mrs. "C," aged 42 years, from a nearby city, came for consultation on October 10, 1938, with various diagnoses from different doctors and finally with a diagnosis of intraocular tumor by the referring oculist. She had noticed some defect of vision in the right eye for four years, without change, but she thought it may have always been a poor eye. She had had some inflammation of both eyes eight years ago, which lasted four or five months, and she said that this recurs in the summer if she becomes overheated. There had been no pain in the eye until the past week. She was wearing: O.D. -0.50D. sph.  $\approx$  -1.00D. cyl. ax. 165°; O.S. -0.75D. sph.  $\approx$  -0.50D. cyl. ax. 180°. With these lenses her vision was O.D. 6/6, O.S. 6/5, and she could readily read 0.50 print with either eye. Muscle balance was exophoria 8 degrees and left hyperphoria 4. Four years ago she had been treated with radium and deep X-ray therapy for carcinoma of the cervix. She had been checked 10 months ago and pro-

nounced all right and was due to return shortly for another check.

The pupils were equal and promptly reacted to light; tension was normal in each eye. *Ophthalmoscopic examination.* O.S., media clear, no pathologic changes in the fundus. O.D., with pupil dilated some vitreous opacities could be seen and some fine changes in the macula. Extending down and out from the macula there was a gray line and fold showing the beginning of a retinal detachment. This was not so sharply marked down and in. Directly below the nerve was a dirty-gray, indistinct, poorly outlined elevation or apparent growth, with several horizontal lines, like folds, over it. The vessels passing over it lacked the normal light reflex. The top of the elevation was plus 20 or more. No tear nor hole could be seen in the retina. Transillumination showed a very definite or dense shadow directly below. The tonometer recorded a tension of 15 mm. Hg. Our diagnosis was a probable intraocular tumor, and, from the history, we suspected it might be a carcinoma; hence made an unfavorable prognosis to the husband. As the patient was due for a check up by the doctors who had treated her for the carcinoma of the cervix we advised that she see them promptly in order to determine the condition of the cervix—whether there had been any local recurrence at the seat of the original lesion and whether there was any indication of metastasis elsewhere. They reported that they found a rent far below, believed it to be a serous detachment, and advised trying operation. This was performed on October 24th. When the patient left the hospital a month later, the referring ophthalmologist wrote: "The retina appears to be completely reattached," and he was unable to see any definite evidence of tumor. "I have tried," he further wrote, "to make it clear to her that in spite of the at present suc-

cessful result of the surgery there is a remote possibility of a tumor showing up." She was seen by another oculist in this city in July, 1939, when there was pain in the left eye. His examination showed a deeply pigmented mass below with a definite shadow, detachment and wrinkling of the retina in the superior nasal area, and hemorrhage on the temporal side. He saw her again on April 9, 1940, a year and a half later, at which time she had what he thought was a large area of retino-choroiditis in the lower part of the fundus. Vision was 6/21.

It looks in this case as though we had been wrong in our diagnosis, but two questions arise in my mind: Will a serous detachment give a dense shadow in transillumination, and does the presence of a rent or hole in the retina exclude a tumor? Personally, I cannot see why in a detachment of the retina surrounding a growth there might not be a rent from the pulling upon or stretching of the retina. We have no subsequent history of this patient and know nothing of the remote possibility of a tumor showing, as the operating doctor suggested.

*Case 4.* Mrs. "D," aged 55 years, came from an adjoining city, on March 8, 1939, referred by an oculist from her home town who had found some serious trouble with the right eye. She reported a marked change in the refraction of this eye. As a result of her last examination she was wearing O.D.,  $-1.50D.$  sph.  $\approx -0.50D.$  cyl. ax.  $180^\circ$ ; O.S.,  $-0.75D.$  cyl. ax.  $135^\circ$  with a  $+2.00D.$  sph. added O.U. for reading. With these, vision was O.D. 5/5, O.S. 5/4, and accommodation was equal in the two eyes. External examination was negative. The pupils were equal, and reacted promptly to light. The tension was normal, and the field normal in each eye except for a slight contraction down and in, in the right eye. *Ophthalm-*

*oscopic examination* O.S. was normal. O.D. with pupil widely dilated there were seen many dustlike opacities in the vitreous; the disc was hazy but of good color. The fundus was normal except in the upper outer quadrant where there was a large prominent detachment of the retina with sharp lower border. The detachment appeared irregular, not smooth—no tear was seen. Transillumination showed a very definite shadow far back at the 11:30-o'clock position. The patient was seen again a week later. Vision did not seem to be so good. The appearance was practically as before—a prominent detachment up and out; directly out the lower horizontal margin of the detachment was sharply defined; up and in, it faded off irregularly into the surrounding retina. Transillumination showed a positive shadow as before. She was advised to see an oculist in another city for further opinion.

This doctor wrote that in his opinion, the patient had a serous detachment of the retina. He found the whole area translucent and could also see a tear in the retina. He operated upon the eye, shutting off the hole, and when she returned in May, two months later, her vision was 20/30 and the retina was in place. In June, in reply to my letter, the oculist who had originally referred her to us reported that up to the present time there is no evidence of a tumor and there is no further detachment.

Evidently, in this case, the error was in our office. There was definitely a difference of opinion in regard to a shadow and a retinal tear. Again the question arises about a serous detachment causing a shadow in transillumination and the importance of a tear in the differential diagnosis between a tumor and a simple detachment.

*Case 5.* Mr. "E," aged 27 years, was



seen in consultation, on December 31, 1921, in his bed at home. We were called by the physician's assistant. The patient had upon several occasions been fitted for glasses to correct some compound hyperopic astigmatism, with resultant normal vision, and had had no trouble otherwise with the eyes. Three or four days before we saw him, he had noticed a blur before his left eye, which came on rather suddenly without any apparent cause. There was no history of injury to the eyes or head nor of any physical strain. He had been using the eyes only moderately. The assistant saw him on the day the blur was first noticed, and made a diagnosis of detachment of the retina. The pupils were widely dilated with atropine; vision sufficed only to count fingers at a short distance. The field was contracted almost to fixation in all directions. Tension was normal or slightly less than in the right eye. *Ophthalmoscopic examination*, O.D., disclosed nothing pathologic; a low hyperopia. O.S., the media were clear; the disc was round, more hazy than in the right eye, especially at the inner edge, hyperemic, and the retina striated. Directly above was a large smooth regularly rounded mass projecting far forward into the vitreous. It rose very abruptly, the vessels could be seen passing over it. There was no detachment, fold, nor irregularity in the retina surrounding it. Transillumination directly above and well posterior showed a very definite dark shadow, whereas to either side of it and from all other directions there was good illumination. A diagnosis of probable sarcoma of the choroid was made, and the patient was advised to have another examination by his regular oculist, who was returning very shortly, and if our findings were confirmed, to have the eye enucleated. His oculist considered it a simple detachment and made a scleral puncture. He reported on December 18,

1922, almost a year later, that the eye had steadily improved after the operation, but we had no opportunity to make an examination. Later, when the patient was having some discomfort, he consulted another Cleveland oculist who found the tension increased and sent him to an oculist in another city, who, in late 1924 or early 1925, trephined the sclera over the site of the lesion. Later he was seen by a still different oculist in Cleveland, who found a well-marked nodular mass in the vitreous and tension 34 mm. Hg, with slight discomfort. He made a diagnosis of intraocular growth and advised enucleation. The patient returned to the oculist who had trephined the eye the year before, and in January, 1926, this oculist removed the eye and found a tumor within the globe. He informed the patient that the tumor was of very recent growth, although I had made the diagnosis of it four years previously. Unfortunately, I do not know what type of tumor the pathologic examination revealed. We saw the patient for simple conjunctivitis in the right eye in 1927, and at that time there was no sign of metastasis elsewhere, a danger which, I felt, had naturally been increased by the long delay. The interesting feature of the case was the long interval between the time when we first saw him and made the diagnosis of the intraocular tumor, and the time when the eye was finally enucleated—a period of more than four years. When we last talked with him over the telephone in 1944, 18 years later, he was in good health, so that evidently the tumor was of the non- or low-malignant type.

*Case 6.* Miss "F," aged 18 years, accompanied by her father, a physician, first consulted us in January, 1927. There was a history of forceps at birth and a contusion of the right upper lid. When she was four or five years old, the parents

noted a slight squint. She was taken to an oculist who told them that the eye was blind. The slight squint continued and varied at times, being more marked when she was tired or not well. She had a strenuous time during the Christmas holidays, attending parties, and spent several days in bed. Upon returning to school she was again in bed for several more days and the nurse noticed the pupil of the right eye was larger than the left. She began having some inflammation and pain in the eye. This became so severe one night that the following morning she consulted a local oculist who told her that he suspected a "neoplasm" in the eye. She returned home at once and was brought to the office.

Examination showed vision in the right eye to be light projection; O.S. 6/5. There was marked strabismus in the right eye with limitation of outer movement. All other movements were normal. The iris was slightly discolored, with several large vessels on the surface and ectropion of the iris pigment around the entire pupillary margin. The pupil was widely dilated above, while below there was a broad posterior synechia; only slight bulbar conjunctival injection. By oblique light, some slight reddish reflex could be made out on the extreme nasal side with numerous glistening spots like cholesterol crystals giving it a mottled appearance; all seen best with a strong plus sphere. A gray reflex showed through a veil directly above, while far to the outer side and above was a gray reflex like extensive exudate with several vessels over it. Directly in the center and below there was no red reflex, only a dense opacity. The slitlamp confirmed these observations. The anterior layers of the cornea were clear; on the posterior surface were a very few fine pigment dots and a few smaller dots on the anterior capsule of the lens. The lens itself showed

nothing abnormal. A fine, apparently organized, semitransparent film could be seen in the vitreous with a large denser mass on the nasal side, blood color. To the outer side the vitreous was more gray or more densely organized with even darker spots, some brown, some slightly reddish, but no definite mass could be distinguished.

Transillumination showed a dense shadow over this area, and good red reflex from all other directions. Oblique light showed a grayish mass with some reddish spots in the lower portion of the fundus. The tonometer reading was 44 mm. Hg (Schiotz).

On the day following, her first visit, I learned that on the day before she first noticed this eye trouble, she had had a fall while skiing and struck the right side of her body and head. This suggested the possibility of an intraocular hemorrhage. I also learned from her oculist, who had seen her in childhood, that ophthalmoscopic examination at that time showed all media clear and an extensive rupture of the choroid involving the macular region with much disturbance and atrophy of the choroid throughout the fundus. Only two years before I saw her, the vitreous, he reported, was clear and there was no sign of iritis. Hot packs were ordered. There was no change the following day, the tension was still 44 mm. Hg. The patient was advised to continue the hot packs, keep quiet, and report. Three days later she was having no discomfort whatever and examination showed no change. Potassium iodide was added to the treatment and the hot packs continued. Four days later she was having no discomfort. Ophthalmoscopic examination showed the same general appearance except that the vitreous was not so dense and more red reflex could be seen in the periphery below, in and out. Transillumination showed the same shadow. I had felt that

the condition was most probably due to an intraocular hemorrhage from the fall and was treating her accordingly. Her age also pointed against the probability of a tumor. The father decided he would like a consultation, to which I gladly acceded, and gave him a letter explaining that the present trouble seemed to have started as the result of a fall in skiing and the history would suggest an intraocular hemorrhage (though other symptoms pointed to an intraocular growth). The interior had shown no change except that the vitreous did not appear so dense as at the first visit and all pain had ceased.

The father took her to another oculist and apparently did not show my letter suggesting an intraocular hemorrhage. Finding a detached retina, dense shadow in transillumination and increased tension, and without the history of the probable cause of onset, the importance of which I stressed in the letter, he concluded it was an intraocular growth and removed the eye the following morning. The father wrote me "there was a growth and I heard some talk of a secondary glaucoma." I was still unwilling to accept this diagnosis, and in March, 1935, eight years later, I finally received a report on the pathologic findings. These showed: "No tumor but a subretinal space filled with a large blood clot containing many cholesterol crystal spaces, and absolute glaucoma." Possibly no other treatment than enucleation would have given her permanent relief, but our original diagnosis of intraocular hemorrhage rather than intraocular tumor was confirmed.

This case illustrates the importance of a careful history in arriving at a correct diagnosis. Later I had the satisfaction and pleasure of informing the father, who had never received a report of the pathologic findings, that he need have no

further anxiety about the possibility of metastasis.

*Case 7.* In this last case to be presented there was no error in the diagnosis but rather a mistake on the part of the patient in not consenting to enucleation when first seen.

Mrs. "G," aged 57 years, came for consultation on September 14, 1908. Vision was O.D. 6/30; O.S. 6/7.5. Five or six weeks previously she had noticed a blur before the right eye on the temporal side. *Ophthalmoscopic examination* revealed an extensive detachment of the retina up and in, with a dense shadow on transillumination. The eye appeared normal externally. There was no discomfort. Tension was normal. The patient was told of the tumor and enucleation was advised, but she was not willing to have the operation. After several subsequent visits, with symptoms each time becoming more evident, she finally consulted us again on March 13, 1909, six months later, when she was having some discomfort and no light perception. Examination showed only red reflex and no view of the fundus. She then consented to the operation and the eye was promptly removed.

The pathologist reported a pigmented spindle-cell sarcoma of the choroid and gave a guarded prognosis as to recurrence.

Four and one-half years later she was reported at Charity Hospital, with extensive growth on the liver—evidently metastasis.

The question arises in this case, whether there might have been a different final outcome if she had consented to the operation six months earlier, at the time of her first visit.

*The Guardian Building.*

# SOME OBSERVATIONS UPON THE CHEMICAL NATURE OF THE PTERYGIUM\*

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Merigot de Treigny and Coirre<sup>1</sup> define the pterygium as follows: "An ocular disease which is characterized by a membranous growth on a level with the bulbar conjunctiva. It is opaque, more or less vascular, habitually triangular, and generally situated in the palpebral aperture. The body spreads fanlike and is movable on the sclerotic which it covers (cf. fig. 1). The disease can lead to blindness by a total encroachment over the pupillary zone and frequently recurs when operated upon."

A complete description of the disease is given by these French ophthalmologists. Duke-Elder<sup>2</sup> stated that the "fully developed pterygium is covered with conjunctival epithelium, stratified with flat cells on the surface of the head and neck. Goblet cells are numerous in the depressions which form glands which may develop into cysts. Throughout the epithelial layer there may be pronounced pigmentation. The stroma is similar to normal sub-epithelial tissue. It is dense and cellular near the apex, elastic fibers are numerous, and patches of amyloid and hyaline degeneration are usually evident" (cf. fig. 2).

Fuchs was probably the only early investigator who made an attempt to study the chemical nature of the stroma of the pterygium. He observed that the hyaline substance was characterized by its homogeneous character, its refractive power, its resistance to acids and alkalis, and by its deep staining with carmine, picro-carmine, and with eosin.

Pterygia are frequently observed on the Ophthalmologic Service of the Char-

ity Hospital. If choline chloride is topically applied to the pterygium its head will become altered.<sup>3</sup> For this reason it was deemed advisable to attempt a study of the chemical make-up of these pathologic growths. Our tests were few, due to the limited amount of material available.

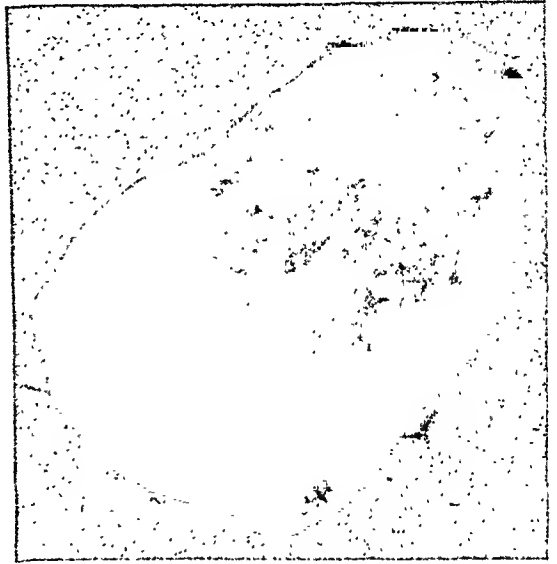


Fig. 1 (Beard and Dimitry). A pterygium.

Three pterygia, very soon after surgical removal from the eye, were boiled out with chloroform in a beaker of hot water. The Salkowski reaction for cholesterol ( $\text{CHCl}_3 + \text{H}_2\text{SO}_4$ ) was very faint but deepened on standing for one or two days. Precipitation with digitonin was unsuccessful owing to the minute amount of cholesterol present. The amount of chloroform-soluble material present in the fresh pterygia is given in table 1.

Our balance was sensitive to about  $\pm 1$  mg. For this reason the figures in the second decimal place in the table are estimates. The presence of about 50 percent of the pterygium as chloroform-

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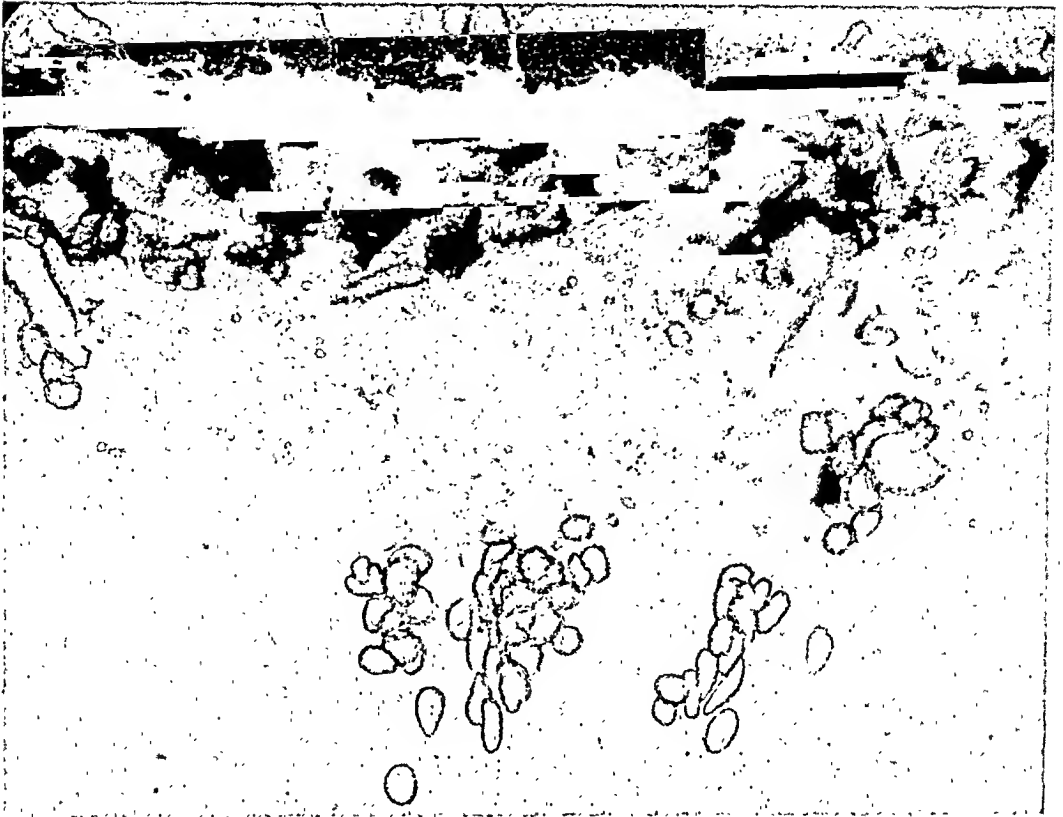


Fig. 2 (Beard and Dimitry). Border of pterygium showing granular deposits soluble in chloroform ( $\times 400$ ).

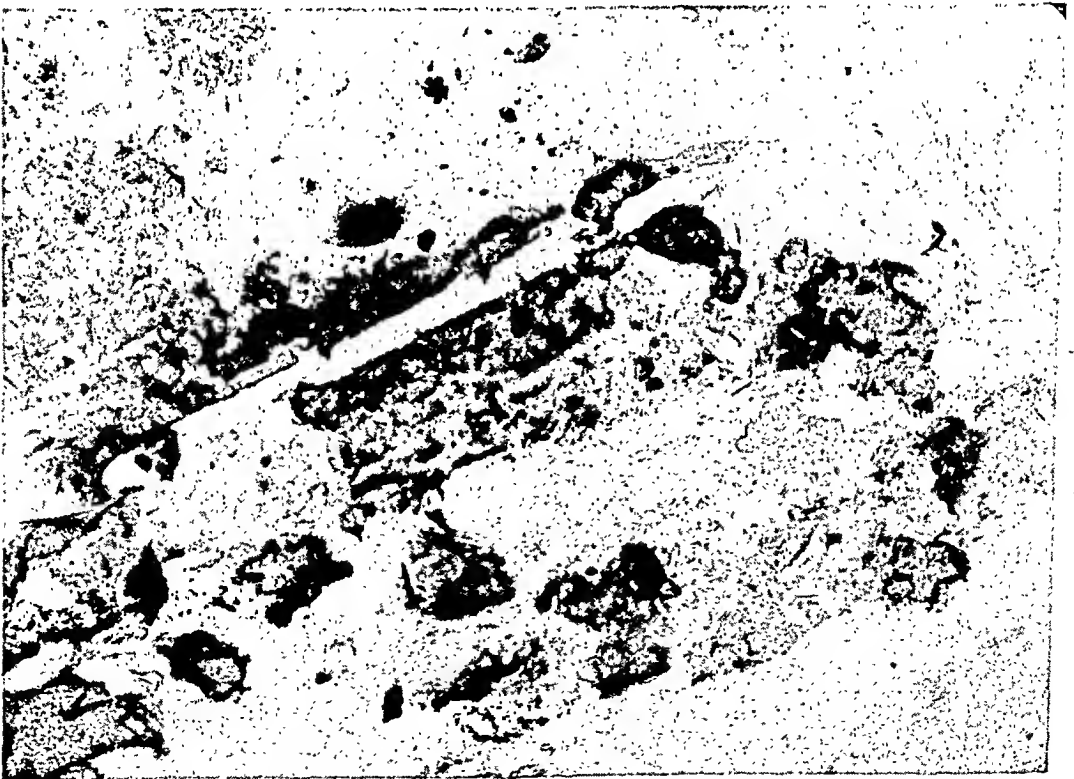


Fig. 3 (Beard and Dimitry). Chloroform-soluble material (fat, fatty acids, and cholesterol) from the pterygium ( $\times 400$ ).

soluble material, possibly fat and fatty acids, is of much interest in relation to the effect of choline chloride\* in causing these growths to disappear. Soon after applying solid choline chloride topically to the head of the pterygium, *changes*



Fig. 4 (Beard and Dimitry). Pterygium after boiling with chloroform.

TABLE 1  
CHLOROFORM-SOLUBLE MATERIAL PRESENT IN  
FRESH PTERYGIA

Sample No.	Weight mg.	CHCl <sub>3</sub> Soluble Material mg.	Residue mg.
1	6.6	2.9	3.7
2	7.7	3.2	4.5
3	9.2	5.1	4.1
Average	7.8	3.7	4.1

occurred. The blood vessels of the body of the growth became greatly engorged with blood and the fatty substances disappeared. Evidently the formation and transportation of phospholipids occurred here as is the case when choline removes the fatty material from liver (its lipotropic action).<sup>4</sup> From these results one may be justified in asking the question, "Is the formation of the pterygium due to a choline deficiency in adults?" This is possible since choline gives dramatic results and the irritation theory of the formation of the pterygium is no longer held.<sup>3</sup>

A photomicrograph of the original

\* Choline chloride of Merck and Company.

pterygium is shown in figure 1 and its border in figure 2. Figure 3 shows the residue obtained of the chloroform-soluble material stained with Sudan III. Figure 4 shows the transparent residue left of the pterygium after chloroform extraction.

#### SUMMARY

Three pterygia were studied after surgical removal. Their average weight was about 8 mg. The chloroform-soluble material amounted to about 47.5 percent of the fresh weight of the growth. A positive Salkowski reaction for cholesterol was obtained, but the amount present was too small to be precipitated with digitonin. The action of choline chloride in causing these growths to become altered is discussed together with a new etiology of the disease.<sup>5, 6, 7</sup>

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# BACTERIOLOGIC STUDY OF HUMAN CONJUNCTIVAL FLORA\*

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The bacterial flora of the human conjunctiva has been studied in Europe and elsewhere from the beginning of this century, and has also been the object of intensive research in the eastern, southern, and central sections of the United States. To our knowledge, however, such a program has never before been undertaken on the Pacific Coast, and the survey made by the Department of Ophthalmology and the Clinical and Research Laboratories of Mount Zion Hospital in San Francisco, therefore, is the first to be reported in this area.

It is known that the conjunctiva of the newborn is normally sterile, and that it later becomes subject to invasion by bacteria. Classification of these organisms into pathogenic and nonpathogenic for the conjunctiva has been more or less well established. The intact ocular mucous membrane is protected histologically by its tissue structure, mechanically by the cleansing action of winking, and chemically by antibodies and the bactericidal properties contained in tears, chiefly from lysozyme. It is interesting to note that lysozyme, an enzyme, was first described in 1922 by Alexander Fleming, who, in 1929, discovered penicillin.

In the presence of reduced tissue resistance due to trauma or abnormality, however, such organisms may invade the

conjunctiva, colonize there, and produce local inflammation or infection. Some types of conjunctivitis can be adequately diagnosed clinically. However, the exact etiology of others is determined only by bacteriologic study of conjunctival scrapings. A microdiagnosis so obtained is often of inestimable value in making possible the correct diagnosis, a more accurate prognosis, and institution of proper treatment. It is also a vitally important preliminary measure in planning intra-ocular operations. A normal-appearing conjunctiva may be discovered to harbor flora which, though nontoxigenic to the sound conjunctiva, may prove toxigenic to the anterior chamber into which they are likely to be carried by the surgeon's knife. With this information available, appropriate prophylactic therapy can be effected. Since we are limiting this paper to bacteriologic observations, treatment will not be discussed here.

Our analysis is based on bacteriologic findings in 152 cases of clinically normal conjunctivas and acute and chronic conjunctivitis from birth to 80 years of age. Although our results substantiate for the most part those published by early authors, improved knowledge of bacteriology and modern methods of culture have yielded a number of microorganisms rarely recorded as residing on the human conjunctiva. They have also proved the absence of certain others, such as the Koch-Weeks and Morax-Axenfeld bacilli. Our statistics conform quite closely to those from other communities, with the noteworthy exception that the pneumococcus was isolated from only two of our patients.

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# BACTERIOLOGIC STUDY OF HUMAN CONJUNCTIVAL FLORA

## TECHNIQUE

Our technique of bacteriologic study was as follows:

*Culture methods.* The conjunctiva and cornea were anesthetized with repeated instillations of 0.5-percent pontocaine. Topical scrapings were made of the palpebral and bulbar conjunctiva with the aid of a platinum spatula (fig. 1). A small sterile swab, moistened with sterile broth, was also used for collecting material. Culture media were inoculated first, and the scrapings were carefully placed on glass slides and stained by Giemsa and Gram stains.

Depending upon the type of infection suspected, media were selected that were suitable for the growth of various bacteria, both anaerobic and aerobic, and fungi. Cultures were inoculated at both 37° and 22°C., since the latter more closely approximates the temperature of the conjunctiva.

The routine medium employed contained Difco proteose peptone (No. 3) and 5-percent rabbit's blood. For the purpose of promoting the growth of hemoglobinophilic bacteria, cooked blood agar was used. The anaerobic bacteria were cultivated in tubes of thioglycolate

broth, and also on blood agar in S<sub>1</sub> dishes. Heart infusion broth was used as a duplicate to permit development of aerobes, and Loeffler's slants for the isolation of the Morax bacillus and related organisms. Cornmeal agar served for the growth of fungi.

The material removed by scraping was



Fig. 1 (Rodin). Platinum spatula used to obtain scrapings from the conjunctiva.

diluted serially, and some of it was exposed for 10 to 15 minutes to the action of an aqueous solution of 1 to 20,000 to 1 to 40,000 crystal violet (to permit intrinsic bacteriostasis of a variety of Gram-positive bacteria) before being cultured. The remainder was inoculated directly into the aforementioned media.

*Animal inoculation.* For the detection of the virus of herpes, some of the material removed from the patient was inoculated into the scarified cornea of a rabbit. The pathogenicity of organisms isolated was tested by subconjunctival and

TABLE 1  
BACTERIAL FLORA OF NORMAL CONJUNCTIVA\*

Age Group	No. Cases Cultured	No Growth	Staphylococcus		Diphtheroids	Streptococcus		More than 1 Organism
			Non-toxicogenic Coagulase Negative	Toxicogenic Coagulase Positive		Nonhemolytic	Hemolytic	
10-20	9	2	6		6			5
20-30	7	2	5		3			3
30-40	6	2	4		1			1
50-60	5	2	3		1			1
60-70	7		5	1	6			4
70-80	8		4	3	4			2
	42	8 (20%)	27 (76%)	4 (10%)	21 (50%)	0	0	16 (40%)

\* There was also one case of *Alcaligenes* in a patient 65 years of age and one case of *Streptococcus viridans* in a patient 49 years of age.



TABLE 2  
BACTERIAL FLORA OF ACUTE CONJUNCTIVITIS\*

Age Group	No. Cases Cultured	Staphylococcus		Diphtheroids	Streptococcus		Miscellaneous Organisms
		Non-toxicogenic Coagulase Negative	Toxicogenic Coagulase Positive		Nonhemolytic	Hemolytic	
0-1	13	5	1	5	1		4
10-20	1	1	1	1		1	
20-30	4	3		3	1		2
30-40							
40-50	2	1		2			1
50-60	2	1	1	1			1
60-70	3	2	2	1			2
	25	13	5	13	2	1	10

\* There were 5 cases of inclusion blennorrhoea in newborn infants, 1 *Streptococcus viridans*, and 1 pneumococcus, type III. One case of *B. pandora*, 1 of *Sarcina*, 1 of *pseudomonas*, 2 of *Alcaligenes*, and 1 of *Gaffkya tetragena* were discovered.

intraocular injection of similar animals.

*Serologic tests.* When lymphogranuloma venereum or gonococcal infection was suspected, the patient's serum was subjected to complement-fixation tests. Agglutination reactions were performed for the diagnosis of brucellar or leptospiral infections.

#### BACTERIAL FLORA OF NORMAL CONJUNCTIVA

Cultures from 42 clinically normal conjunctivas were examined bacteriologically. To these patients' knowledge, and according to their case histories, they had had no ocular disturbances. The organisms most commonly recovered were staphylococci (76 percent) and diphtheroids (50 percent), usually in combination. The parallel incidence of these two bacteria was seen to be lowest at an age between 20 and 40 years, highest in the 50-to-60-year age group, and to remain consistently elevated thereafter. Mixed cultures were fairly uniform in incidence throughout the span, and were noted in 40 percent of all eyes examined. These findings vary insignificantly from those of Khorazo and Thompson,<sup>1</sup> who

report an increase in diphtheroids and mixed cultures in direct ratio with the age of the patient, particularly accentuated in the 30-to-49-year classification (38 percent). *Alcaligenes* was present in one case and *Streptococcus viridans* in another. No *Streptococcus*, pneumococcus, or *Sarcina* was isolated. Occasionally in these eyes, bacteriologic study fails to reveal any growth whatsoever, but this is a rare occurrence (8 out of 42 cases, 20 percent). On the other hand, many organisms may be present on conjunctivas exhibiting no clinical evidence of inflammatory reaction. This is particularly true of *Staphylococcus*, which is known to be an inhabitant of most normal conjunctivas. Some strains of both *Staphylococcus aureus* and *Staphylococcus albus* are considered toxin producing and others nontoxin producing,<sup>2</sup> and the object of bacteriologic examination is to determine which strains are present in a given eye.<sup>3</sup> In our experience, the coagulase test yields the most reliable results. The problem of diphtheroids has been studied, and a report of the findings is now in the process of publication.

BACTERIAL FLORA OF ACUTE  
CONJUNCTIVITIS

Twenty-five cases were studied. Here as in clinically normal eyes, *Staphylococcus* and diphtheroids predominate. In addition, *Streptococcus nonhaemolyticus* appeared twice, and *Streptococcus haemolyticus* once in 25 patients. An unusual finding was that of *B. pandora*. A scraping from a rubber plant owned by the patient revealed an identical growth. A single case each of *Sarcina*, *pseudomonas* and *Gaffkya tetragena*, and two cases of

*Alcaligenes* were present. Only one case of pneumococcus was isolated in an infant, whereas in Thygeson's<sup>4</sup> report this organism was the most frequent source of infection in acute and subacute conjunctivitis in Iowa. In San Francisco,<sup>5</sup> the *Staphylococcus aureus*, hemolytic and toxigenic, seems to be the most frequent etiologic agent in conjunctivitis of a certain clinical type.

The bacteriologic examination in conjunctivitis of 13 newborn infants revealed 5 cases of inclusion blennorrhea.

TABLE 3  
BACTERIAL FLORA OF CONJUNCTIVITIS OF THE NEWBORN

Name	Age	Clinical Data	Bacteriologic Observations
1. T.	5 days	5 days after birth, child showed purulent discharge from both eyes; father had gonorrheal urethritis; mother had vaginal abscess during pregnancy.	Vaginal smear of mother negative; scrapings from baby's tarsal and bulbar conjunctivas showed epithelial-cell inclusions characteristic of inclusion blennorrhea; no bacteria on smear or culture.
2. J.	21 days	13 days after birth, swelling and discharge, left eye; right eye involved; 8 days later, lids edematous and red; purulent secretion.	Cytoplasmic bodies characteristic of inclusion blennorrhea; <i>Staphylococcus albus</i> nontoxigenic.
3. P.	3 days	3 days after birth, purulent secretion from right eye.	Smear, few epithelial cells, no bacteria nor inclusion bodies; culture, several colonies of <i>Staph. albus</i> , occasional colonies of <i>Str. nonhaemolyticus</i> and <i>Str. viridans</i> , also a few diphtheroids.
4. M.	23 days	Purulent discharge from right eye.	Gram stain, many pus cells, no bacteria, no inclusion bodies; culture, <i>Staph. albus</i> and a few diphtheroids.
5. T.R.	11 days	Purulent discharge from left eye.	Smear, gram-positive cocci and leucocytes, also few gram-negative rods; culture, <i>Staph. aureus haemolyticus</i> .
6. N.	2 days	Purulent discharge from both eyes.	Smear, epithelial cells, diphtheroid bacilli, no inclusion bodies; culture, <i>Staph. albus</i> and diphtheroids.
7. G.	2 days	After birth, greenish discharge from both eyes.	Culture, <i>Staph. albus haemolyticus</i> , <i>Staph. aureus</i> and diphtheroids.
8. K.	2 days	Conjunctivitis, left eye, at birth; eczema of face.	Direct smear, no bacteria; culture, <i>Staph. aureus</i> .
9. C.T.	7 mos.	Infection began 3 days after birth, with purulent discharge.	Pneumococcus, type III.
10. C.	1 day	2 hours after birth, swelling and discoloration of upper lids, especially of left eye; purulent secretion.	Direct, smear, numerous white blood cells; culture, no growth.
11. Z.	2 mos.	10 days after birth, lids were sticking with secretion. Conjunctiva red.	Inclusion bodies suggestive of inclusion blennorrhea.
12. W.	5 wks.	Discharge right eye for 1 wk. Eyelids swollen.	Typical inclusion bodies present and diphtheroids.
13. L.	14 days	Left eye red with discharge; difficulty in opening eyelids.	Inclusion bodies suggesting inclusion blennorrhea.

This infection of the newborn is caused by a filtrable virus, and is a distinct clinical entity occurring acutely 5 to 10 days after birth. It is very important to differentiate microscopically between inclusion blennorrhoea of the newborn and ophthalmia neonatorum of gonococcal origin.<sup>6</sup> These infants were seen in an acute stage of the disease, and showed severe inflammation, edema, and infiltration of the conjunctiva, and purulent

through 60 years. *Haemophilus influenzae*, *Bacillus subtilis*, *Micrococcus catarrhalis*, and *Bacillus mutabilis* were isolated once each from patients 40 to 70 years of age. Children are usually free from chronic conjunctivitis. A five-year-old child was the youngest to be affected in this series.

Culture study in chronic conjunctivitis is at times of tremendous value in diagnosing the underlying cause.<sup>7</sup> For example, a patient proving refractory to treat-

TABLE 4  
BACTERIAL FLORA OF CHRONIC CONJUNCTIVITIS\*

Age Group	No. Cases Cultured	Staphylococcus		Diphtheroids	Streptococcus		Sarcina	Miscellaneous Organisms
		Non-toxicogenic Coagulase Negative	Toxicogenic Coagulase Positive		Nonhemolytic	Hemolytic		
1-10	4	1	2	3		1	1	1
10-20	7	5	2	4	1			
20-30	10	7	4	5			2	1
30-40	21	15	9	10			1	3
40-50	12	9	5	7			2	2
50-60	13	10	2	9			4	2
60-70	13	9	8	10			1	2
70-80	5	3	2	2				
	85	59	34	50	1	1	11	11

\* There were 2 cases of lymphogranuloma venereum; 2 of trachoma; 5 of *Gaffkya tetragena*; 1 of *Alcaligenes*; 1 of *Haemophilus influenzae*; 1 of *Bacillus subtilis*; 1 of *Micrococcus catarrhalis*; 1 of *Micrococcus mutabilis*.

discharge. It is interesting to note that in one case the father had a gonorrheal urethritis, and the mother a vaginal abscess during pregnancy.

Other bacteriologic findings in the newborn are described in table 3.

#### BACTERIAL FLORA OF CHRONIC CONJUNCTIVITIS

Eighty-five cases of chronic conjunctivitis were studied. *Staphylococcus* and diphtheroids still dominate the picture, and their incidence increases with advancing age. The *Streptococcus* was recovered only twice, but *Sarcina* and *Gaffkya tetragena* were quite constant in a small proportion of eyes from one

ment for conjunctivitis was referred for bacteriologic examination. Microscopic study of the growth from conjunctival scrapings revealed trachoma as the primary infective agent, and *Staphylococcus* secondary. *Staphylococcus* is frequently superimposed in trachoma infections, and the latter should be suspected in long-standing cases. Our patient was a 52-year-old woman who worked in a clinic as a nurse's aide, treating Indians who were infected with trachoma. Laboratory findings showed *Staphylococcus aureus* haemolyticus and diphtheroids. Inclusion bodies suggestive of trachoma were found. The second patient was a man, aged 72 years, with chronic conjunctivitis

TABLE 5

BACTERIAL FLORA OF CONJUNCTIVAS PRIOR TO CATARACT EXTRACTION

	Name	Age	Eye	Bacteriologic Findings
1.	C.F.	74	R.E.	Staph. albus nonhaemolyticus.
2.	G.M.	60	L.E.	One colony of Staph. albus nonhaemolyticus; 50-100 colonies diphtheroids.
3.	A.O.	61	R.E.	Few colonies Staph. albus hemolyticus; diphtheroids.
4.	B.H.	54	R.E.	Staph. albus haemolyticus, nontoxigenic. Staph. aureus haemolyticus, nontoxigenic.
5.	A.M.	40	L.E.	No bacterial growth.
6.	M.M.	65	R.E.	Staph. aureus nonhaemolyticus; diphtheroids.
7.	A.N.	48	R.E.	No bacterial growth.
8.	A.N.	49	Tabes L.E.	3 colonies of Str. viridans and diphtheroids. Some colonies Staph. albus.
9.	L.R.	36	R.E. Myotonia dystrophia	Several colonies of Staph. albus.
10.	L.R.	37	L.E. Myotonia dystrophia	Several colonies of Staph. albus.
11.	H.S.	38	L.E.	One colony Staph. albus.
12.	D.F.	52	L.E. Injection of bulbar conjunctiva	Profuse growth of Staph. albus, nontoxigenic. Following treatment no growth 10 days later.
13.	J.M.	72	L.E.	Staph. aureus haemolyticus, toxigenic; 100 colonies. Following treatment, 20 days later 1 colony Staph. aureus haemolyticus, toxigenic.
14.	A.R.	64	L.E.	Cataract extracted from right eye elsewhere with vision 20/30. 6 years later eye became red with hypopyon, panophthalmitis developed, eye enucleated. Left eye scheduled for surgery. Clinically conjunctiva normal, culture showed 150 colonies Staph. albus (nonhemolytic) and 50 colonies diphtheroids. Operation postponed. 4 days later acute conjunctivitis developed. 2 months later culture revealed 25 colonies Staph. albus and 8 diphtheroids. Month later culture showed few colonies of Staph. albus. Preliminary iridectomy done. 6 days after operation eye became red with purulent discharge from conjunctiva. This cleared up. Later cataract extracted without complications.
15.	E.E.	82	L.E.	Staph. albus and aureus haemolyticus, numerous. After treatment, 20 colonies Staph. albus and 2 colonies Staph. aureus haemolyticus; 6 colonies diphtheroids.
16.	G.O.	70	R.E.	Cataract removed without culture study, followed by infection. Dense membrane formed. Before discission, few Staph. albus nonhaemolyticus. Vision obtained 20/40.
17.	E.B.	71	L.E. Simple glaucoma with trephining Eyeball injected	Three colonies Staph. albus.
18.	C.D.	69	L.E.	One or 2 colonies Staph. albus.
19.	M.B.	82	L.E.	Three colonies Staph. aureus haemolyticus, toxigenic. As the conjunctiva was clinically normal, patient was hospitalized. During the night, the eye became red. Culture taken 10 days later showed few colonies of Staph. aureus. Rehospitalization; eye again became red. Culture study later showed 80 colonies of Staph. aureus haemolyticus. Treatment. Cultures showed no growth.
20.	W.L.	63	R.E.	Few colonies Staph. albus.
21.	A.M.	41	R.E.	No bacterial growth.

of one year's duration. Cultures revealed *Escherichia coli* and a nonhemolytic *Streptococcus* not corresponding to Lancefield's groups A, B, and C. Suspicious-looking inclusion bodies suggesting trachoma were present.

The two cases of lymphogranuloma venereum are of interest. These occurred in Negroes 32 and 33 years of age, in whom a clinical diagnosis of chronic conjunctivitis, corneal ulcers, and hypopyons had been made. Complement fixation with psittacosis antigen indicated the presence of lymphogranuloma-venereum infection. Cultures yielded hemolytic and nonhemolytic staphylococci.

#### BACTERIAL STUDY OF CONJUNCTIVA PRIOR TO CATARACT EXTRACTION

There is no uniformity of opinion as to whether or not a bacteriologic study of the conjunctiva should be made before cataract extraction. Some surgeons hold that if the eye is clinically normal and there is no obstruction to the nasolacrimal apparatus, the eye may be considered safe for operation. If the eye is not clinically normal, and if under treatment the infection cannot be cleared up, a culture study is then of value to determine whether bacteriologic conditions make operation a safe procedure. Others prefer to have bacteriologic studies made prior to every intraocular operation.

Browning,<sup>8</sup> who has made an extensive bacteriologic study of eyes at the Moorfields Hospital, emphasizes the importance of a preoperative bacteriologic study. "Bacterial infection is one of the causes of failure following the operation of cataract extraction. It was the cause of the loss by removal of about 1 per cent of the eyes operated on for cataract at Moorfields. . . . With modern bacteriological methods, most, if not all of these cases could be avoided, and I think that if all conjunctival sacs were bacteriologi-

cally examined before operation there would be fewer postoperative infections, or infections during the operation."

Our policy has been to advise postponement of cataract extraction when six or more colonies of *Staphylococcus haemolyticus* toxigenic, or two or more of *Streptococcus haemolyticus*, *pneumococcus*, or *Bacillus pyocyaneus* are present.

Table 5 presents data on 21 consecutive cases of cataract, of which 20 were studied bacteriologically before extraction. Of these, 18 had clinically normal conjunctivas. In 16 cases, there was either no growth or only a few colonies—not sufficient to justify postponement of the operation. Case 13 showed 100 colonies of *Staphylococcus haemolyticus* toxigenic, which cleared up under treatment.

Case 14 is of interest. A cataract was extracted from the right eye, with vision obtained of 20/30. Six years later the eye became red with hypopyon. Panophthalmitis developed and the eye was enucleated. One year later the left eye was scheduled for a cataract extraction. Clinically the conjunctiva was normal. However, a culture showed 150 colonies of *Staphylococcus albus* (nonhemolytic) and 50 colonies of diphtheroids. The operation was postponed. Four days later the patient developed an acute catarrhal conjunctivitis. Two months later a culture revealed 25 colonies of *Staphylococcus albus* and 8 of diphtheroids. One month later culture showed only a few colonies of *Staphylococcus albus*. A preliminary iridectomy was done. Six days after the operation the eye became red and there was a purulent discharge from the conjunctiva. This cleared up. The patient was treated with autogenous *Staphylococcus vaccine*. Later cultures showed a few colonies of *Staphylococcus*, and the cataract was extracted, without complications.

The patient in case 15 had numerous

colonies of *Staphylococcus aureus* and *albus haemolyticus*, which also disappeared under treatment.

Case 19 was that of an obese female, 82 years of age, who had bilateral cataracts. Culture study showed three colonies of *Staphylococcus aureus haemolyticus* toxigenic. As the colonies were few, and the conjunctiva was clinically normal, she was hospitalized. During the night the eye became red. Culture taken 10 days later showed a few colonies of *Staphylococcus aureus*. She was again hospitalized, and during the night the eye again became red. Culture study later showed 80 colonies of *Staphylococcus aureus haemolyticus*. The eye was treated, and subsequent cultures showed no growth. There was no infection following cataract extraction.

There were two eyes which clinically showed injection of the conjunctiva. Case 12 displayed a profuse growth of *Staphylococcus albus nonhaemolyticus*. Ten days later, following treatment, there was no growth.

Case 17 was of a patient who had simple glaucoma of the left eye where a trephining had been done. After the trephining, the tension remained normal. Adhesions between the iris and the lens took place, and a secondary cataract formed. The eyeball appeared to be injected. The culture showed three colonies of *Staphylococcus albus*. In view of the few colonies present, it was felt safe to extract the cataract. This was done without subsequent infection.

The patients in all cases reported here were operated upon without infection following cataract extraction, with the exception of case 14 and case 16. In case 14 there was a purulent conjunctivitis six days after a preliminary iridectomy. In case 16 the cataract was extracted without a previous culture study having been made. Postoperatively, an acute

iritis developed, with the formation of a dense membrane. Nine months later, culture showed a few colonies of *Staphylococcus albus nonhaemolyticus*, and dissection was done. Vision obtained was 20/40.

### SUMMARY

1. Bacteriologic study of the conjunctiva is of inestimable value in the diagnosis, prognosis, and treatment of infection of the conjunctiva, especially of clinically obscure conditions. It is important in determining the safety of operation on potentially infected eyes presenting cataract.

2. An analysis of 152 cases including persons with normal conjunctivas, acute and chronic conjunctivitis, and precataract-extraction conjunctivas so studied is presented. Bacteriologic investigation of conjunctival scrapings was carried out by the technique described.

3. The organisms most commonly recovered from clinically normal conjunctivas were *Staphylococcus aureus* and *albus*, hemolytic and nonhemolytic, toxigenic and nontoxigenic, and diphtheroids. More than one organism was present in almost half the cases. Notable was the absence of Koch-Weeks and Morax-Axenfeld bacilli.

4. Certain clinical types of acute conjunctivitis in San Francisco are marked by the predominance of *Staphylococcus aureus* (hemolytic and toxigenic), and of diphtheroids. Cultures demonstrated five cases of inclusion blennorrhoea of the newborn. A single case of pneumococcus, type III, was discovered in an infant.

5. In chronic conjunctivitis, *Staphylococcus* and diphtheroids are the most frequent findings, increasing in incidence with advancing age. Two cases of trachoma and two of lymphogranuloma venereum, referred with a diagnosis of chronic conjunctivitis, were diagnosed with the

aid of laboratory procedures. Staphylococcal infection was superimposed in all.

6. Twenty-one consecutively studied cataract cases are reported. Of these, 18 patients had clinically normal conjunctivas. Sixteen of them showed no growth, only a few colonies, not enough to justify postponement of the operation. Three showed many colonies, which, under treatment, cleared up, and the operation was done without the development of an infection. The only case in which an infection occurred following the cataract extraction was in a patient who clinically

had a normal conjunctiva, and a culture had not been done previous to the operation.

It would seem advisable to postpone an operation in the presence of six or more colonies of *Staphylococcus haemolyticus* (toxigenic), or two or more of *Streptococcus haemolyticus*, *pneumococcus*, or *Bacillus pyocyaneus*.

We wish to thank Anna C. Riis and Marian C. Shevky for their bacteriologic assistance.

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# NOTES, CASES, INSTRUMENTS

## ANTERIOR MEGALOPHTHALMOS AND ARACHNODACTYLY

### A CASE REPORT

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### CHARACTERISTICS

The average horizontal diameter of the cornea is 11.6 mm., while the vertical diameter measures 10.6 mm.<sup>1</sup> In all cases of anterior megalophthalmos the corneal diameters are enlarged and may even reach 18 mm.; but in addition to the enlarged corneal diameters, there are other signs, according to Vail,<sup>2</sup> such as: 1. It is hereditary. 2. Always bilateral and limited to the male sex, except in cases of consanguinity. 3. Absence of all signs of glaucoma. 4. Deepening of the anterior chamber. 5. Iridodonesis. 6. Atrophy of the stroma of the iris. 7. Embryotoxin. 8. Dislocated or tremulous lens. 9. Sometimes a melanosis of the cornea. 10. Unusually visible nerve fibers in the cornea. 11. Sharply defined corneoscleral margin.

### CASE REPORT

D. D., a white female, aged five months, was seen on the Ophthalmic Service at Cincinnati General Hospital on October 27, 1941. Diagnosis of arachnodactyly had been made at birth, and the patient had been recently readmitted to the hospital for reduction of intussusception. Recovery was uneventful. Until the present admission the patient had never been ill.

Inspection of the eyes revealed a striking enlargement of the cornea, measuring 15 mm. in the horizontal and 14.5 mm. in the vertical diameters. The cornea was transparent, and the limbus sharply demarcated. There was no evidence of em-

bryotoxin. A marked corectopia of the pupils was present, the right pupil appearing displaced nasally and downward. The upper half of the pupils was oval whereas the lower half terminated in an acute angle, much as in the letter V. They measured 2 mm. in the horizontal diameter and 3 mm. in the vertical diameter, and reacted well to light and accommodation. The anterior chamber was very shallow and the irides a pale blue. Examined with a plus 20 lens, the superficial stroma of the iris was seen to be atrophic, with a complete absence of the normal crypts, while the radiating arrangement of the iris fibers was very conspicuous. There was no iridodonesis. The lens was in normal position, the media were clear, and the fundus was seen distinctly with a plus 4 lens. The disc of the right eye was elliptical in shape in the 80° axis, while the left disc was elliptical and in the 110° axis. The choroidal vessels were very apparent, giving the fundus a tessellated appearance.

Slitlamp examination and tonometric measurements could not be made; however, the tactile tension was normal. Transillumination did not reveal the "target reflex" described by Vail.

Physical examination disclosed a thin, white, female baby possessing fine blond hair and a dolichocephalic skull. The chest was somewhat funnel-shaped, but the remarkable finding was the abnormal thinness and length of the long bones of the body (dolichostenomelia), especially of the hands and feet, the latter having the appearance of the limbs of a spider, hence the name arachnodactyly. There was a muscular wasting of the arms, forearms, hands, thighs, legs, and feet. The abdominal muscles did not share this process. There was no kyphosis. There



was a marked flexion deformity of the fingers resembling a "claw hand." The ligaments about the joints of the shoulder, elbow, wrist, hips, knees, and ankles were especially lax. The legs could be bent flat on the back and crossed with no semblance of pain. The external malleoli of the tibia were very prominent. There was no clubbing of the fingers, and nails were normal. However, there was a tiny supernumerary digit on the ulnar side of the hand.

The skull was symmetrical in shape, palate and teeth were normal, and no abnormality of the ears was noted. The lungs and heart were normal as also the abdominal viscera (noted at operation). Neurologic examination was negative.

Radiograms of the hands and feet revealed a marked increase in length out of all proportion to the body height. However, there was no abnormality in the bone structure *per se*. The sella turcica and clinoid processes were normal for this age.

The thyroid and other endocrine glands were apparently normal.

Gross and microscopic examination of the urine was entirely negative and the blood count was normal. The Wassermann test was negative.

Inasmuch as this disease has a familial tendency, an inquiry was made into family history, especially as pertaining to the eyes. The grandparents, as far as could be ascertained, had normal eyes. The parents were not related. Five other children exhibited normal corneas, although the diameters were slightly larger than normal.

#### THEORIES REGARDING ETIOLOGY

The hereditary and etiologic aspects of this disease have been discussed in great detail by many other authors. I merely wish to stress the theory of gene ex-

change by Rados<sup>3</sup> as being more satisfactory in the explanation of the variations found in megalophthalmos. The present paper shortage precludes a discussion of his theory, but with it in mind, one easily sees how conditions such as anterior megalophthalmos can exhibit a megalocornea and atrophy of the iris, or megalocornea and a shallow anterior chamber, or megalocornea and ectopia of the lens, or that there may be megalocornea alone. Any of the aforementioned combinations are possible according to the disturbance in the original gene. The major characteristics enumerated by Vail are not necessary for a diagnosis of megalophthalmos.

Anterior megalophthalmos may be associated with a long, slender body structure as in the case herein described, or with embryologic defects in the skin about the orbit, as in a recent case not published, or associated with polydactyly, syndactyly, and other abnormalities.

There are then many variations to be expected in an anomaly such as anterior megalophthalmos. In my case the anterior chamber was shallow instead of deep, the lenses were not ectopic, and of course there was no iridodonesis, although all of these signs could develop in later life. A better term to describe these variations might then be suggested such as anterior dysophthalmos. Anterior megalophthalmos, megalocornea, persistent pupillary membrane, ectopia lentis (usually transmitted as a dominant characteristic), microphakia, microcornea, and anterior microphthalmos (colobomata\* of the iris often seen) could then be classified as variations of anterior dysophthalmos.

\* If the mechanical hindrance to the development of the iris is operative at an early stage before the iris has begun to grow forward, a coloboma results; but if it becomes operative after the iris is already partly formed, an ectopia is produced (Duke-Elder, v. 2, p. 1318).

## SUMMARY

A case of arachnodactyly associated with anterior megalophthalmos has been presented. Emphasis has been given to the genetic aspects of the disease. It has also been shown that there are many variations of anterior megalophthalmos, which is to be expected, owing to the infinite number of variations of minute

disturbances in the genes. Finally, a term has been suggested, anterior dysophthalmos, which, while not conveying the thought of an enlargement of the anterior segment, does cover all the variations found in this disease as well as others of a related nature.

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## SUCTION INSTRUMENT FOR CATARACT EXTRACTION\*

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For the removal of cataracts by means of suction, this instrument was devised to provide the following advantages: It is easy to manipulate; the suction power is adequate; and the suction is self-controlled in being automatically cut off when the cap is removed from the lens.

The Dimitry syringe was used to produce the suction, but it was found that the suction power of this instrument could be increased to great advantage.

This instrument displaced a 5-mm. column of water 45 mm. in height, a value increased to 65 mm. by shortening the stem of the piston.

A 6-inch length of firm rubber tubing connects the syringe to the handle by means of adaptors.

The handle having the suction needle is easy to manipulate and was made to correspond in curvature to the Kirby intra-capsular-lens forceps.

\* From the Department of Surgery, Division of Ophthalmology, Western Reserve University, Medical School.

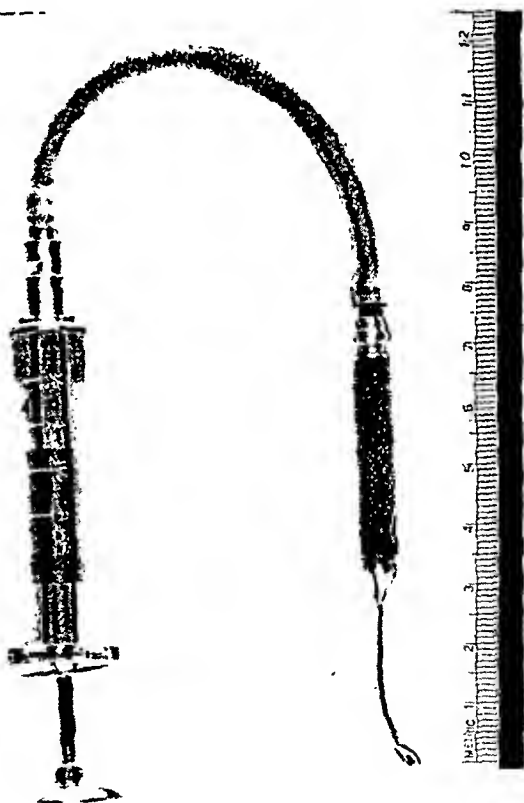


Fig. 1 (Thomas). Suction instrument for cataract extraction.

In using the instrument the assistant holds the syringe and the suction is applied as directed by the operator.

## RETINOSCOPY AT A VARYING DISTANCE

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Speed is a desideratum in the preliminary phase of a refraction. The frequent changing of lenses in a trial frame before a patient's eyes during retinoscopy is wearisome and time-consuming. At the conventional distance of one meter the examiner must rise repeatedly from his seat in order to reach the trial frame and change the lens. The use of a vertical bar or frame of spherical lenses is scarcely less troublesome. The patient must be instructed how to hold and move it properly; furthermore, any tilting of the bar will introduce a false astigmatic factor.

The procedure to be described\* should eliminate some of the usual changing of lenses. It also should enable the examiner to ascertain rapidly whether or not astigmatism is present, and if so, the approximate amount.

The examiner sits at a distance of about three quarters of a meter from the patient, and, flashing his retinoscope, moves toward the patient and watches for a point of reversal. If the reversal involves all meridians a spherical error, of course, is present, and no appreciable amount of astigmatism should exist. If the reversal occurs in only one meridian, the distance from the patient's eye is measured quickly along a marked tape that is stretched from the patient's eye to the retinoscope. The examiner then moves in still closer until the opposite meridian shows a point of reversal. Again, this distance is measured on the tape. The dioptric value of the difference between the two distances indicates the amount of astigmatism. Following is a detailed explanation and description.

The examiner sits at a distance of 75 cm. from the patient. If the eye is hypermetropic and astigmatic a sufficiently strong convex spherical lens is placed in the trial frame before it to bring the first point of reversal (the far point of the first of the two principal meridians that have been made artificially myopic by the convex sphere) to a distance of a little less than 75 cm. from the patient's eye. Usually one or two lens changes will be sufficient to find the right strength for converting the "with" movement of the image of the illuminated retinal area to an "against" movement. If the eye is myopic and astigmatic a sufficiently strong concave sphere is placed before it in order to advance the image of the illuminated retinal spot to a point that is a little less than 75 cm. from the patient's eye. Once the proper lens is in front of the eye the examiner moves in along the marked tape (to be described in the next paragraph), flashing his retinoscope alternately in the horizontal and vertical meridians until a point of reversal is seen in one of the meridians (until the "against" movement of the image changes to a "with" movement). At this point the position of the retinoscope along the tape (the distance from the patient's eye) is noted. The examiner then continues to approach the patient until a reversal occurs in the opposite meridian. Again the position of the retinoscope along the tape is noted. Then, moving slowly backward, the examiner checks his findings by once more observing the positions of the two points of reversal. This time the change will be from a "with" to an "against" movement. Once the proper spherical lens is in place the examiner can perform this whole measurement without leaving his seat by simply bending from the hips first forward slowly and then backward. The difference in the dioptric values of the two distances on the tape indicates the amount of astigmatism that is present.

\* Very likely this procedure is not original. The author, however, is not aware of its use by anyone else.

Ordinary narrow cotton or linen tape may be used. A mark is made near one end. The patient holds the tape against the side of his face so that the mark is in line with the front of his cornea. Various convenient distances are marked off on the tape starting from the mark. The dioptric values of these distances are printed over each mark. The following values represent a suggested series of distances and their designations: at 15.4 cm., 6.5D.; at 16.7 cm., 6D.; at 18.2 cm., 5.5D.; at 20 cm., 5D.; at 22.2 cm., 4.5D.; at 25 cm., 4D.; at 28.6 cm., 3.5D.; at 33.3 cm., 3D.; at 40 cm., 2.5D.; at 50 cm., 2D.; at 66.6 cm., 1.5D.; and at 75 cm., 1.3D. If the examiner holds the retinoscope with the right hand he loosely takes hold of the tape near its middle with his left hand. As soon as a point of reversal is noticed the tape quickly is stretched taut as far as the retinoscope, and mental note is made of the dioptric value of that distance.

The author has found this procedure to be useful in some cases. Its basis is a change of distance rather than the conventional change of lenses. No procedure is universally applicable, and a stereotyped method of refraction cannot be used satisfactorily in all cases.

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## EYE FINDINGS IN RHEUMATIC FEVER\*

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In recent years there has been a marked trend to delete rheumatic fever as the basis for eye involvements such as iritis, iridocyclitis, uveitis, choroiditis, episcleritis, scleritis, and the like.

The Quarterly Cumulative Index Medicus shows a marked diminution of

articles describing eye lesions as a complication of rheumatic fever. The Index Catalogue of the Library of the Surgeon General's Office shows a similar trend:

1st series—1880-1895 reference was made to 13 books and 53 periodicals.

2d series—1896-1916, one book and 39 periodicals.

3d series—1917-1932, one periodical.

4th series—1936-1942, no listing of books nor periodicals.

The reason for this trend is undoubtedly due to the more scientific investigation of a patient and improvements in our laboratory technique. Previously, ocular pathology in which difficulty was experienced in determining its cause was relegated to the category of rheumatic fever. Frequently this would provide a "catch all" for syphilis, tuberculosis, gonorrhea, and other diseases that may provide the basis for a joint involvement and the true diagnosis would have eluded the examiner.

This is well illustrated by Fuchs<sup>1</sup> in describing paralysis of the orbicularis muscle. "These are rheumatic paralyses for the most part of which, however, the real cause is not known." Elsewhere in the same volume by Fuchs several eye conditions are described as being due to rheumatism. To mention two of the more vague references: page 197, rheumatism as etiology for scleritis and sclerosing keratitis; page 222, episcleritis rheumatica.

The existence of a doubt as to etiology is well exemplified by Knies<sup>2</sup> in 1895. "An acute articular rheumatism must be regarded as an infectious disease, although a typical agent of inflammation has not been discovered."

E. V. L. Brown,<sup>3</sup> in 1937, calls attention to the fact that rheumatic iritis is not specific.

In 1915, A. E. Davis<sup>4</sup> stated: "Some of the affections of the eye which have a rheumatic origin are: Iritis, cyclitis, epis-

\* This article concerns itself primarily with acute rheumatic fever and not with the chronic arthritides, since these are, in most instances, of an undetermined etiology.

cleritis, scleritis, keratitis, sclero-keratitis, inflammation of Tenon's capsule, muscular paralyses and optic neuritis and even glaucoma have been attributed to it." This gives a concrete example of the numerous disease entities formerly ascribed to rheumatic fever.

The uncertainties of treatment and diagnosis are reflected in the two following quotations: Emil Erroth,<sup>5</sup> 1932, advises "a change of climate to be of benefit in cases of rheumatic iritis."

F. E. Noboa-Recio,<sup>6</sup> 1941, suggests X-ray examination of joints to establish the identity or type of joint involvement and also the use of the sedimentation test.

The present trend to minimize rheumatic fever as the cause of ocular disease is the more plausible because the eye complications are thought of as a part of the picture of syphilis, tuberculosis, gonorrhea, and the like, and are classified under that heading, hence the scarcity of literature of recent date captioned rheumatic fever as an etiologic basis for various and sundry eye involvements.

A careful study of the eyes in 105 cases of rheumatic fever at Buckley Field has resulted in essentially no eye findings. This is emphasized by the fact that approximately 200 additional rheumatic-fever cases have been confined to this hospital during the same interval of time—September, 1943, to March, 1944, inclusive—without unusual subjective or objective eye symptomatology. Two additional Army hospitals in this area, Lowry Station Hospital and Fitzsimons General Hospital, likewise report negative findings; the first in 300 cases of rheumatic fever and the second in 50 cases.

The most recent work at this time credits the group-A hemolytic streptococcus as probably being the exciting factor in rheumatic fever. One hundred five cases were selected at random and

were carefully examined as to vision, anterior segment, media, and fundi. The pupil was dilated in all cases to allow access to the extreme periphery of fundus.

The cases were classified under three headings: (1) severity (mild, moderate, severe); (2) stage (early, mid, terminal); (3) eye findings.

Severity:	Stage:		
Mild	12	Early	18
Moderate	40	Mid	40
Severe	53	Terminal	47

These figures would indicate a fairly good cross section of cases. We were anxious to obtain this so that if any ocular pathologic changes were manifested as a transient involvement they should have been discovered in some of the cases examined.

The eye findings were as follows:

- (1) Eyes normal throughout, 94;
- (2) Injection of deep conjunctival vessels, 9;
- (3) Blood in veins dark, 2;
- (4) Vision in no case was impaired as a result of rheumatic fever.

An analogy between joint involvement and teno-synovitis was considered. A purpling of the deeper conjunctival vessels was found in nine cases; however, the classical symptoms of a teno-synovitis were nonexistent.

Fields: Fields were taken in 20 cases of recurrent rheumatic fever, for it is our impression that these cases would be the more likely to show a field defect provided there was at any time during the course of the disease an involvement of the optic pathway. No field defect was found. An isopter of 2/1,000 was employed.

These results were in marked contrast to the finding of Pillat as quoted by Lowenstein<sup>7</sup> "Foci similar to the foci in miliary tuberculosis can be found in 61% of the cases of acute rheumatic fever by ophthalmoscopy."

An interesting observation made in regard to the patients who received massive doses of salicylates was that approximately 50 percent of them observed visual phenomena described as lights passing across their field of vision. This was noted to a lesser degree in those receiving penicillin. The phenomena was also markedly reduced in the controls who received soda bicarbonate and/or bed rest. The intensity of light was described by different individuals as varying in intensity from silver spots to the appearance of a roman candle.

In approximately 20 percent of the cases there was evidence of increased rapidity of the fatigue time of accommodation. This was noticed mostly in those who were hyperopic to a moderate degree and who were not conscious of asthenopia before contracting rheumatic fever. Chief complaint was "tiring of the eyes" after reading for a short time. Frequently a general debilitating illness will result in this finding.

In conclusion, it is our impression that the group-A hemolytic streptococcus, presumably causing rheumatic fever, may involve the eyes. However, we are convinced that rheumatic fever has in the past been accredited as the etiologic basis for eye conditions for which it was not responsible. This confusion is easily understood, as the rheumatic involvement with hemolytic streptococcus is far different from the ordinary reaction to this organ-

ism, the former being on an allergic basis.

In a careful study of 105 cases of rheumatic fever which was taken as a typical cross section of 650 cases in all, together with a review of literature, we are convinced that there is no ocular pathologic change pathognomonic of rheumatic fever.

"Penicillin and the sulfa preparations have to date had no definite therapeutic value in the treatment of rheumatic fever,"<sup>8</sup> therefore it should not be of benefit in treating an ocular complication of rheumatic fever.

Grams<sup>9</sup> and I concur with Lowenstein<sup>1</sup> in the impression that rheumatic fever is an allergic manifestation pathologically characterized by fibrinoid necrosis of collagenous ground substances followed by a cellular response known as the Aschoff body.

The credit for the last two conclusions should be given to the departments, mentioned in references, which are also engaged in research work on rheumatic fever under the auspices of Major General David N. W. Grant, Surgeon for the Army Air Forces, and his staff.

*202d General Hospital Unit.*

Since the time this paper was written, I have examined approximately 45 more cases of rheumatic fever. Three patients had transient scotomas, which entirely disappeared within 30 to 90 minutes. One of these was due to an angiospasm of a branch of the central retinal artery; the other two to angiospasm of an artery in the occipital cortex.

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# SOCIETY PROCEEDINGS

EDITED BY DONALD J. LYLE

## ROYAL SOCIETY OF MEDICINE

### SECTION OF OPHTHALMOLOGY

November 12, 1943

MR. FRANK A. JULER, *president*

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#### INTRAOCULAR FOREIGN BODY

MR. J. W. E. CORY presented an engineer, aged 37 years, who was seen on October 12, 1943. He gave a history of having got something in his right eye three days previously.

A large metallic foreign body was seen lying in, or just posterior to, the posterior capsule of the lens. There was a small entrance wound at the 2-o'clock position, 2 mm. from the limbus, but there was no visible injury to the iris.

The vision was R.E. 6/60 (previous to accident 6/36 improved to 6/9) and L.E. 6/6. The fragment, which was part of a brass cotter pin, showed indistinctly in the X-ray picture and was nonmagnetic.

There seemed to be very little reaction after five weeks and it was deemed advisable not to operate unless a cataract developed.

#### FLOCCULI

MR. R. A. D. CRAWFORD presented a soldier, aged 25 years, who had had no previous trouble with his vision until he complained of blurring of the vision of the left eye in strong sunlight. He had flocculi of both irides, larger in the left eye than in the right, and in the left eye there had formed an anterior attachment to the back of the cornea. No reference to this condition, last named, could be found in the literature. The condition apparently resulted from a failure of clos-

ing and cystic dilatations of the marginal sinus.

*Discussion.* Mr. F. A. Juler said that he had never seen an attachment to the cornea of this kind. The common "grape-seed bodies" protruded into the pupil, but he had not seen them hanging in the anterior chamber.

Mr. A. Greeves said that it seemed likely to him that the mass was not actually attached to, but merely in contact with, the posterior corneal surface against which it was flattened on account of its bulk.

#### EPIBULBAR DERMOID WITH RUPTURE OF CYST CONTENTS INTO ANTERIOR CHAMBER

DR. VICTOR PURVIS reported the case of a child, aged one year and four months, who was brought to Moorfields Hospital one year ago with a history of a swelling on the right eye since birth. Recently a sudden increase in the size of the swelling had been evident.

On examination it had all the appearances of an epibulbar dermoid, but there was an amount of white flocculent material in close proximity to it in the anterior chamber. It was considered that this material was the contents of a ruptured dermoid cyst. During the next few months the eye became irritated from time to time and the flocculent material became absorbed, drawing down the pupil in the process.

Two months ago another mass of material suddenly appeared in the anterior chamber near to the cyst, as if the latter had ruptured once more. It was proposed to wash out the anterior chamber to ascertain the nature of the material and enable a correct diagnosis to be made. If the tumor proves to be a dermoid it is unique, for these are rarely cystic at this site and are not known to rupture into

the anterior chamber in the way described. On the other hand it might have been an implantation cyst in spite of the fact that there was no history of injury.

#### THE INCIDENCE AND TREATMENT OF OPHTHALMIA NEONATORUM

PROF. ARNOLD SORSBY said that ophthalmia neonatorum has been a notifiable disease in England and Wales since 1914, and has shown some decline in incidence. There is, however, considerable variation in the rate of notification in different parts of the country, pointing to different conceptions as to what constitutes notifiable ophthalmia neonatorum. Replies to a questionnaire sent to lying-in centers indicate a rate of gonococcal ophthalmia of 0.8 per 1,000 births. On this basis there are annually about 500 cases of this type of ophthalmia neonatorum and a total of about 2,000 cases of all types throughout the country.

The annual returns of the Ministry of Health indicate a steady decline in the incidence of impaired vision and blindness from ophthalmia neonatorum.

Antenatal care is of prime importance, as is shown by excellent results in eliminating ophthalmia neonatorum at such centers as Sheffield Street Hospital for mothers suffering from venereal disease. Prophylactic drops instilled into the eyes of babies at birth are no absolute safeguard against gonococcal ophthalmia, as the occurrence of 98 cases in 119,075 births given in the returns of the questionnaire show. On the basis of these returns the incidence of gonococcal ophthalmia is 0.9 per 1,000 births when silver nitrate is used as a prophylactic, and 0.7 per 1,000 births when other preparations are used (generally argyrol).

The immense advance marked by the sulfonamides in the treatment of ophthalmia neonatorum of all types is shown by the fact that in 500 cases treated at White Oak Hospital during January,

1940, to October, 1943, no less than 72.2 percent cures were effected within eight days (against 15.2 percent of cases treated by the classical method).

*Discussion.* Dr. Letitia Fairfield said with regard to the question of notification, that London was the pioneer in collecting cases of ophthalmia neonatorum into a specialized hospital (Saint Margaret's now evacuated to White Oak). The London notification rate was only about 9 per 1,000 as against the 60 per 1,000 of Birmingham, but the results were very similar.

She said that the prophylaxis used for infants in the London County Council wards was very much like that described by Professor Sorsby, and the variety of drugs employed seemed to matter little. The figures showed that antenatal care seemed the main preventive factor, but a certain number of cases did slip through in spite of very careful antenatal work.

Prof. Chassar Moir said that a slight inflammation of the eyes was very common in the first week of life. Cases of "sticky eye" were often not notified, and discrepancies in statistics could be largely explained by this fact. As prophylaxis against gonococcal ophthalmia, silver nitrate has stood the test of time, but it was also true that silver-nitrate solution was irritating and frequently produced a chemical conjunctivitis of its own. His belief was strengthened by the fact that after the use of a 2-percent solution of silver nitrate instead of the usual 1-percent, cases of inflammation were much commoner and more severe. The possibility of serious harm resulting from the reckless repeated use of silver nitrate, the other name of which is lunar caustic, should be realized. Better methods of treatment were now available.

Mr. Frederick Ridley said that his experience had also been that the use of silver nitrate did undoubtedly lead to a large incidence of "sticky eyes." The



treatment of such eyes by silver-nitrate drops was definitely harmful. He believed it was dangerous to use even a 1-percent solution of silver nitrate upon a baby's cornea which was already ulcerating, and he thought it should be barred. The acidity of a 1-percent solution of silver nitrate kept in a tightly stoppered bottle had reached the value of pH2. The concentration also continually increased by evaporation, and he had seen silver-nitrate crystals formed in a dropper bottle; such drops were capable of blinding a baby.

Argyrol was a safe and even more effective prophylactic than silver nitrate. It did not change spontaneously on keeping; even if it became concentrated by evaporation, it did not become harmful. He would strongly advocate that argyrol be used in the place of silver nitrate as a routine prophylactic.

Professor Sorsby, in closing, said it was futile to rely upon one solitary measure for the elimination of ophthalmia neonatorum. In the whole range of public health there was no procedure which would rely on one drop of an antiseptic to prevent the development of infection in people who had been exposed to it. Antenatal care was extraordinarily important as the figures had shown.

In very many institutions silver nitrate was used as a standard method. It had been used in millions of births so that it could not be so desperately dangerous as some people believed. That did not mean, however, that there were no better drugs. The figures obtained from lying-in hospitals possibly showed argyrol to be superior to silver nitrate, but the series was too small from which to judge.

#### RUPTURE OF RETINAL CYST CAUSING RETINAL DETACHMENT

MAJOR C. DEE SHAPLAND (RAMC) presented J. S., a soldier, aged 28 years, who was sent to the hospital on Septem-

ber 20, 1943, because of failing vision in the right eye, noticed for the previous six weeks. On August 2, 1943, the day before he noticed that the vision in the right eye was misty, he had felt a sudden sharp shooting pain lasting about two or three minutes in the region of the right temple, and felt giddy and faint.

On examination, on September 20th, the right eye was white and there were no keratitic precipitates. The pupil was active and the tension was normal. A flat detachment of the retina was present temporally, extending from the 6:30- to the 11-o'clock position. From the 7- to the 9- o'clock position there was a prominent thin-walled retinal cyst, with ragged dialysis from 7:30- to the 9-o'clock position. The interesting feature was a linear band of retinochoroidal pigmentary disturbance delimiting the periphery of the cyst above and below. This disturbance was the type usually seen at the high-water mark of static detachments of long standing. Therefore the cyst was old.

It had evidently ruptured at its peripheral attachment at or just behind the ora serrata, and the delimiting band of choroidoretinal adhesions had given way over the nasal part of the cyst and caused a spreading detachment of the retina over the temporal half of the fundus. The macula was involved in the detachment, and central vision was reduced to 3/60. The visual field was contracted nasally.

Operation was performed on September 24, 1943. The external rectus was detached and a barrage of surface diathermy applications was placed around the periphery of the scleral-surface marking of the cyst. One needle puncture was made over the center of the cyst and another at the 6:30-o'clock position, 12 mm. from the limbus. The patient was kept in bed in the Fowler position with both eyes padded for two weeks and was allowed up for an hour on the fifteenth

day. The retinal detachment went back and the cyst was smaller and outlined by a zone of diathermy reactions. The contraction of the diathermy punctures had pulled down the wall of the cyst and caused it to shrink. The dialysis was still clearly visible and open. The retina was in place. The central vision was 6/24, partly. The visual field was full except for a defect on the nasal side corresponding to the cyst and diathermy reactions.

This case was interesting in that a retinal dialysis, as had long been suspected, could definitely be produced by the rupture of a cyst and that little or no trauma caused its rupture. In this patient the periphery of the cyst tended to be sealed off by a zone of spontaneously formed retinohoroidal adhesions, and a portion of these gave way on the formation of the dialysis and so caused a spreading detachment of the retina.

*Discussion.* Mr. C. B. Goulden said that the connection between retinal cyst and disinsertion had long been suspected, and some suggestive findings by Weve of Utrecht gave support to this possibility. He had found that the retroretinal fluid removed in cases of disinsertion had similar enzymes to those found in the fluid from a retinal cyst. He believed that in cases of retinal cyst operation should be undertaken before they gave rise to disinsertion, as they were much more easily managed.

Dr. T. H. Whittington said that he recalled several cases of retinal cysts. One was in a man who came for a detached retina due to a disinsertion, and in making the routine examination of his eyes an unruptured peripheral cyst was found at exactly the corresponding spot in the other eye. The second patient was a nurse who had a disinsertion which looked just like a ruptured cyst, and there was an unruptured cyst of similar appearance close by. Both cases were successfully treated.

## COLORADO OPHTHALMOLOGICAL SOCIETY

November 20, 1943

DR. C. A. RINGLE, *president*

### CARCINOMA OF THE CHOROID

DR. F. NELSON presented the case of Mrs. B. G., a white woman aged 65 years, who was first seen September 8, 1943. She complained that two days previously a brown cloud had appeared before her left eye in the lower part of the visual field.

The fundus of the left eye showed a very flat disclike elevation about 10 disc diameters wide, and of not quite that height, located above the macular region. The elevated area slanted very gradually to the normal level of the retina. The elevation at the highest spot was about 6 diopters, corresponding to about 1.5 mm. The color of the detached area was slightly yellowish-pink. Both eyes had a refractive error of about 5 diopters. The corrected vision was R.E. 5/5, L.E. 5/8 partially. The visual field of the left eye showed a relative scotoma corresponding to the detached area.

The history was somewhat difficult to establish, since the patient was a Christian Scientist and was reluctant to reveal exact data of previous illnesses. The right breast had been removed in August, 1938, but the patient had noticed a lump in that breast since 1935 or 1936. She had refused surgery at that time. She complained of loss of weight and showed signs of vitamin-B deficiency. There was irregular pigmentation on the dorsum of both hands and the tongue showed changes which were characteristic of pellagra.

The patient was admitted to Glockner Hospital, and a diagnosis of detachment of the retina of the left eye due to possible metastatic malignancy in the choroid

was made. During the period of observation the detached area seemed to flatten and the positive scotoma became less noticeable. The patient became more and more dyspneic and cyanotic. An X-ray picture of the chest showed thick shadows over the whole left lung field, indicating invasion of the tumor into that lung. During the last week of her life she became more disoriented and had hallucinations. The patient died on October 11, 1943.

Autopsy showed generalized carcinomatosis. The brain was free of metastases but showed a number of minute cortical hemorrhages. The left lung was almost totally involved in tumor masses invading numerous bronchi. The right lung was affected to a minor degree. The primary tumor of the right breast had not invaded the chest wall. A number of coin-shaped cancerous lesions were found in the liver, particularly on the convexity and in the lobus quadratus. The heart was not enlarged but showed a number of flat tumor masses in front of the conus arteriosus. The tumor had invaded the heart muscle deep into the interventricular septum. A very advanced sclerosis of the coronary arteries apparently had prevented the tumor from invading the arteries themselves, so that in this case the sclerosis had given the heart a certain amount of protection. The left eye was enucleated, *post mortem*, and showed a flat carcinoma of the choroid above the posterior pole in about the same extension as the ophthalmoscope had revealed. Cross sections through the stump of the optic nerve showed a tiny strand of accumulated tumor cells in the outer layer of the nerve sheath, probably located in a small lymph vessel. It is possible that the metastases in the choroid spread from this strand.

*Conclusions.* A breast carcinoma was removed probably three years after the

beginning of the primary tumor. Extensive metastases occurred five years after the first operation and about eight years after the beginning of the primary tumor. The first subjective and objective manifestation of generalized carcinomatosis was in the choroid.

#### MALIGNANT MELANOMA OF THE RIGHT CHOROID

DR. F. NELSON presented the case of Mrs. A. A. F., aged 54 years, who was first seen on August 22, 1938. She complained of continuous flashes in the right eye which had been present for about 18 months. A diagnosis of focal infection had been made.

The eyes were externally normal. The corrected vision was R.E. 5/5, partially; L.E. 5/4. A large detachment of the retina was found in the nasal section of the right eye. The detachment was hemispherical in shape and showed no fluctuation nor folds. The color of the detachment was slate-gray with some darker spots shining through the retina. Transillumination revealed complete darkness in the detached area, indicating a tumor formation behind the detachment. The intraocular pressure was 18 mm. Hg (Schiotz) in both eyes. The visual field showed a large peripheral scotoma corresponding to the detached retinal area. A diagnosis of malignant melanoma of the choroid of the right eye was made. Enucleation was advised and performed the next day.

Histologic examination revealed a malignant melanoma of the choroid mushrooming into the intraocular space at the nasal side of the globe. In some sections wandering of tumor masses along one posterior ciliary nerve was observed. This perforation could not be seen macroscopically. Pigment cells were more abundant in the intrascleral tumor.

The patient was seen once a year, the

last time on October 13, 1942. At that time no local recurrence was found and there was no evidence of metastasis to any other part of the body. The patient was warned to watch for liver or gall-bladder trouble. During the summer of 1943 the patient developed some abdominal distress and reported loss of weight. A surgeon detected an enlargement of the liver and did an exploratory laparotomy on July 19, 1943, and found definite malignancy of the liver. The patient died on October 8, 1943.

Metastasis to the liver is more frequent in cases of malignant melanomata of the uveal tract. In this case almost seven years elapsed between the first ocular symptoms and the patient's death. Abdominal operations in such cases are usually unnecessary and contraindicated. Specimens of the tumor were shown microscopically.

#### BILATERAL OCULAR INJURY

DR. V. H. BROBECK presented the case of M.G., aged 14 years, who was injured by the explosion of a dynamite cap on June 19, 1940. When he was first seen, one hour following the injury, the distal phalanx of the thumb, middle finger, and ring finger of the right hand were destroyed. The upper two-thirds of his face was the site of countless small perforating abrasions and punctured lesions of the skin and eyelids.

The anterior chamber of the right eye showed considerable hyphemia. Two small lesions, one on the cornea and one on the episcleral region below the level of the insertion of the right internal rectus muscle, were quite probably locations of the perforating foreign bodies. After clearing occurred in this eye, a fairly large glistening foreign body was observed in the lower nasal anterior segment. Beneath it was a large area of chorioretinitic damage.

In the left eye, the lens soon became cataractous following its perforation by a metallic fragment. After a period of six weeks the synechiae in this eye were freed by a keratome incision at the 3-o'clock position, the lens was "puddled" and the anterior chamber irrigated with saline. This resulted in the recovery of a brass foreign body, 0.5 by 1 mm. in size.

Two years after the injury, the right eye, still containing the copper in the vitreous, was quiet, and the vision was 0.8. It had never showed signs of irritation since the first inflammatory reaction subsided, but the vision finally was reduced to light perception.

The vision of the aphakic left eye was 0.5 with +16.00D. sph.  $\ominus$  -4.50D. cyl. ax. 135°; +3.00D. sph. added for near vision.

Many consultants in the Middle West agreed to leave the right eye unmolested under a régime of frequent inspection. The left eye had just recovered from an attack of iridocyclitis.

#### QUESTIONABLE DETACHMENT OF THE RETINA

DR. E. N. NEEPER presented Mrs. A. C., who was first seen in August, 1927, at which time she was 26 years old and a patient in a tuberculosis sanatorium. Headaches and blurring of vision were relieved by correction of refractive error. Ophthalmoscopic examination showed a small inflamed area just below and slightly to the temporal side of the disc in the right eye, and an old pigmented area, 1.5 mm. in size, below the disc in the left eye. The area was surrounded by moderate hyperemia.

At various times during the following five years choroidal tubercles in different stages were seen in both eyes, each such area finally healing with only slight or no perceptible damage. Old tuberculin, in his opinion, proved to be the treatment of

choice. A period of 10 years elapsed without any complaints referable to the eyes or general health. Since November 12, 1943, however, the patient had complained of floating opacities and flashes of light, day or night, on quick head movements. The vision, L.E., was 20/15-2. Examination of the visual field showed a moderate scotoma above and to the temporal side. Copper-tinted linear opacities were present in the vitreous. No detachment folds nor prominences could be seen. There was, however, slight pallor below the disc and macula. Visual field, taken on November 18th, revealed a 20-degree, deep, irregular, crescent-shaped blind area 15 degrees below the macula.

This case was presented as a probable simple, flat, retinal detachment. The diagnosis was based largely on the presence of the blind area and the photopsia. The absence of any central scotoma, headache, and pain in the orbit on eye movement or pressure ruled out retrobulbar neuritis.

*Discussion.* Dr. George Stine suggested as a possible diagnosis a low-grade uveitis, but thought that the case required further study.

#### HERPES ZOSTER OPHTHALMICUS

Dr. E. N. NEEPER presented Mr. J. A., aged 65 years. He gave a history of severe influenza in January, 1943, which left him in poor health. In March, 1943, he complained of much pain in and above the left eye. A diagnosis of neuralgia was made by his physician. The use of hot compresses was instituted, but it was thought that the hot packs scalded the skin and that a skin infection followed on the forehead. During the four months that followed he suffered much pain. The patient was seen for the first time by Dr. Neeper on July 13th, when the diagnosis was obviously herpes. Posterior synechia was present. The ciliary ring was greatly injected. The cornea stained

throughout. The vision, L.E., was ability to see light.

When last seen only one narrow tongue of the synechia remained. Occasional corneal staining occurred. There was intermittent slight ciliary injection, and while the patient was conscious of all of the involved area most of the time, paroxysms were gradually becoming less frequent. The vision at this time was 20/120 owing to the lens and corneal haziness. As the toxins are gradually eliminated it is hoped that useful vision will be restored.

Medication consisted of atropine, para-drine, phemerol, sulphonamides, and dionin.

*Discussion.* Dr. J. W. Lamme reported good results in the treatment of this disease from the use of sodium iodide, snake venom, and viosterol.

W. A. Ohmart,  
Secretary.

#### SAINT LOUIS OPHTHALMIC SOCIETY

November 26, 1943

Dr. CARL BEISBARTH, *président*

#### THE USE OF DORYL IN GLAUCOMA

Dr. J. F. HARDESTY presented a paper on this subject which has been published in this Journal (1944, v. 27, June, p. 625).

*Discussion.* Dr. John Green said that his experiences with doryl coincided closely with those of Dr. Hardesty. He told of a complicated case which he had seen with Dr. Carl Beisbarth at the Saint Louis County Hospital. The patient had absolute glaucoma in one eye and was having an acute attack of glaucoma in the other eye. At the time of admission to the Hospital the vision was reduced to perception of hand movements and shortly thereafter to ability to see light. An iridectomy was done on the better

eye with beneficial effect that lasted about one month. Following that a corneoscleral trephining operation was performed by Dr. Beisbarth, using a 3-mm. trephine. After this operation a normal tension was maintained for at least a year, following which the patient developed a uveitis, with recurrence of the increased tension. After treatment at De Paul Hospital with suprarenin bitartrate locally, general medication, and the removal of several infected teeth, the tension was reduced but did not return to normal. Several months later two cyclo-diathermy operations were performed, resulting in a moderate reduction of tension and the maintenance of vision of 20/60. Pilocarpine and eserine apparently had no effect on the tension. Doryl was finally used and caused a marked lowering of the tension within a short period of time. A tension of 40 mm. Hg (Schiotz) could be reduced to 20 mm. Hg in an hour after instillation. There was no appreciable effect on the pupil.

Dr. William H. Luedde reemphasized some of the things Dr. Hardesty had discussed. He said that doryl does seem to offer some real advantages. In his experience he had had the greatest satisfaction from the use of doryl in cases of postcataract glaucoma, in which cases it usually seemed dependable. He had had some patients who were sensitive to doryl and who exhibited marked sweating and discomfort following its use.

Major James Allen (MC), by invitation, said that in the past 18 months his experience with glaucoma had been limited to two cases, for glaucoma is not encountered very often in the Army. He said that doryl has been used for a number of years and it has been found to be somewhat unreliable. It is not readily absorbed through the cornea. It may be, however, that if something could be done to the cornea to increase the penetration of doryl through it, the effect

might be better. In the early experimental work on rabbits Oppenheim abraided the cornea and got uniform action. He began to use a solution of 1:3,500 zephiran containing doryl. Repeated use of doryl in this concentration of zephiran often leads to eventual denudation of the epithelium of the cornea. In one early case where it was used four or five times a day for about one month the patient's eye developed a superficial keratitis and beginning vascularization of the cornea. Reducing the concentration of zephiran to 1:5,000 in this case cleared the cornea of the superficial keratitis but the vascularization continued. The patient had no loss in vision, however. It is, therefore, important to prescribe doryl in weak solutions of zephiran. It is not felt that doryl is the final answer to the problem. It has been found quite effective in cases following cataract extraction, but in a great many cases the use of doryl will not prevent a secondary operation.

Dr. Hardesty, in closing, agreed that doryl seemed more effective in glaucoma following cataract extraction than in other types of glaucoma and that unfortunately it is not a general panacea for glaucoma. It does, however, have a real place in the treatment of glaucoma that is not controlled either by the ordinary miotic or by operation, and thus is a real addition in the methods available for treating glaucoma.

#### THE RESULTS OF ORTHOPTIC TRAINING AT THE WASHINGTON UNIVERSITY EYE CLINIC

DR. JAMES H. BRYAN reviewed the results obtained by orthoptic training on strabismic patients at the Washington University Eye Clinic in the 15 months between May, 1942, and September, 1943, while the orthoptic technician, Miss Anita Steltzer, was available to the Clinic. In that period of time 125 different patients were seen in the Orthoptic Clinic, exam-

ined, their conditions diagnosed, and the future care of their strabismus recommended. Twenty-seven members of this group did enough work with the technicians to make it worth while considering them in this survey. These patients were analyzed and compared with the somewhat similar group that had been seen in the Clinic two years previously and treated with all the various means to correct strabismus with the exception of the work on the machines. It was found that with the exercises: (1) The angle of deviation was not affected in the great majority of cases by the exercises. (2) In the 11 cases of abnormal retinal correspondence 3 patients were cured of the condition; 2 had the angle of anomaly reduced to almost zero, although still somewhat variable; and 6 showed no improvement, although 3 of these 6 should not be considered because they had had less than 10 sessions each. (3) The degree of fusion was improved from no fusion at all to first-degree fusion in one case, and to second-degree fusion in eight cases. Four patients who had no or little fusion ability did not improve in degree. (4) The amplitude of fusion was increased by an average of  $24^{\Delta}$  in six of the nine cases of exotropia. In nine cases of esotropia the range of fusion increased an average of  $21^{\Delta}$ . Nine others were not improved. It was concluded that orthoptic exercises were of definite value and should be included along with the other methods available in order properly to treat cases of strabismus.

*Discussion.* Dr. Benjamin Milder, by invitation, said that it is quite generally agreed that the goal of orthoptic training, together with all other measures in the treatment of strabismus, is the establishment of comfortable binocular vision. To achieve this goal, the orthoptic program pursues somewhat the following sequence: (1) refraction; (2) occlusion,

for amblyopia ex anopsia; (3) if anomalous retinal correspondence exists, it must be broken up, and normal regional point-to-point relationship established; (4) suppression must be overcome, if it exists; (5) then, with the ability to superimpose images, amplitude of fusion is developed; (6) stereopsis is stimulated; and (7) the capacity for the eyes to function, with fusion and stereopsis, under normal conditions of use, must be developed.

The chief stumbling blocks, he believed, are the above-mentioned numbers 3 and 7. He cited references which showed the achievements realized by others in overcoming the obstacles (Hitz, J., *Amer. Jour. Ophth.*, 1941, v. 24, p. 1017; Berens, C., Elliott, A. J., and Sobacke, L., *Amer. Jour. Ophth.*, 1941, v. 24, p. 1418).

In comparing the report by Dr. Bryan with those of Dr. Hitz and Drs. Berens and Elliott and Miss Sobacke the following points should be considered: (1) the newness of the program at this institution; (2) the small number of cases followed; and (3) the inclusion of some cases which, in retrospect, may have been eliminated as candidates for orthoptic training before they began. In this connection, care must be taken to exclude patients with stubborn amblyopia, low I.Q., marked anisometropia, innervational anomalies (such as alternating hyperphoria), and fixed abnormal retinal correspondence (as evidenced by no signs of improvement in the first 10 treatments).

Perhaps there will be a time when an orthoptician can supervise daily orthoptic training at the grade schools, using Board of Education equipment, during the "orthoptic" period of the daily school routine.

James T. Bryan,  
Secretary.

# AMERICAN JOURNAL OF OPHTHALMOLOGY

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## DEFINITIVE CARE OF THE WAR BLINDED

According to the present plan war-blinded soldiers are sent to one of two hospitals on our east and west seaboard, respectively. They are kept in these hospitals until their wounds have healed and no further medical care is needed, at which time they are sent to Old Farns Convalescent Hospital in Avon, Connecticut, for 16 weeks of careful examination, to determine their capacities for further education or occupation. Here they are also aided in making their individual adjustment to the world of blindness which they have entered. An important item is in the education of their families, who must be taught not to be overly sympathetic, but to have an encouraging yet realistic attitude.

After their discharge from Old Farns, about which time their pension begins and their discharge from the Army takes place, they are released to the Veterans Administration, which organization has the responsibility for their further care, and, incidentally, of distributing their pension to them. The first two phases of the handling of these blinded veterans is being admirably carried out. But the phase of initiating the life-long care that should follow the preliminary work is not being so satisfactorily administered. Quite obviously it is extremely difficult because the soldier is on his own, with money in his pocket, probably in most cases more than he has ever had before, and he wants primarily to get home and forget about the war and the Army. His family also think that his future happiness will be



best served at home where they and his acquaintances can comfort him and possibly help him spend his Army pension.

Our country is justly generous to these men, allowing them \$190 per month for life. It is regrettable, however, that there seems to be a tendency to consider that the payment of this allotment is all that need be done and that the man may safely be left to shift for himself, trusting that local organizations for the blind, if any, will interest themselves in his case and give him aid and counsel.

It is understandable that the care of from 500 to 1,000 blinded veterans may seem a very minor matter for an organization that must help an enormous number of veterans handicapped in other ways because of their service in the Armed Forces. However, every single disabled veteran is deserving of the best possible care that can be given him, and this principle should apply to the blind perhaps even more fully than to any other type of war-handicapped, because their incapacity is probably the most difficult for which to make adjustments and certainly is one that is most likely to prevent those afflicted from resuming a normal and happy life.

Blindness constitutes perhaps the greatest change in the physical being, and certainly in the viewpoint, that occurs to any of these soldiers. It, therefore, behooves us to see to it that no stone is left unturned in following through with each of these men to make sure that every chance is being given him. An able director in the Veterans Administration whose only concern is the care of war-blinded is a first requirement. This director should be personally familiar with every one of the war-blinded and upon his release from Old Farms should know exactly where each man is going and what he plans to do. A card-index system should be maintained for these individuals, the local blind agencies contacted, and definite plans made for the occupa-

tion of the soldier or his further training if that is necessary. Every bit of red tape should be scrapped and the most direct methods possible employed.

In England this is done very satisfactorily by an essentially private agency known as St. Dunstan's, which acts in full coöperation with the government. For such a duty a private agency is probably not so desirable as is a governmental one. The care of the war-blinded is a national obligation and has been recognized as such by our government when it assigned the definitive care of these soldiers to the Veterans service. This service in all fairness should accept the assignment as an important mandate and should attempt to carry it out in some such manner as is done in England by St. Dunstan's. Whether the idea of a central institute which may serve as a home on occasion for these boys is necessary may be disputed, although the advantage of such a center as a stimulus to the blinded and to the Veterans organization itself cannot be denied. This would be valuable in permitting the blind soldiers to keep in touch with one another and to the organization in maintaining a close relationship with the blinded. But whether or not the central institute is adopted as a part of the program, at least a most careful, intelligent, and continuous follow-up throughout the life of the individual is his due and should be undertaken.

It is natural, perhaps, for ophthalmologists to regard the care of the blinded as quite apart from their own activities because the objective of the ophthalmologists' training has been the restoration and preservation of vision. Few of them have had intimate contacts with the blind or have studied their problems closely. Even so, they must not ignore their obligation since ophthalmologists are held responsible by the public for the care of these unfortunates who have given so much to make life safe and comfortable for them and their children. It behooves

every eye physician definitely to concern himself in the future of these war-blinded, nationally and locally. Eye societies should try to find out when the newly blinded return to their communities and might well appoint committees whose task it would be to keep in touch with these men and make sure that they are not forgotten and that the Veterans organization is doing all that can be done for those thus handicapped in their communities.

Lawrence T. Post.

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### LOS ANGELES STUDY CLUB

The leaders in the organization known as the Los Angeles Research Study Club are emphatic in attributing to Edward Jackson the inspiration for the creation of this most successful adventure in post-graduate education.

Prior to 1928, Jackson, enthusiastic over the success of the Colorado summer course in ophthalmology and otolaryngology, in whose development he had been the prime mover, suggested to some of his West Coast colleagues that they should establish a similar course under the favorable climatic conditions existing in the winters of Southern California.

At the invitation of Doctors Ray Irvine and M. J. Weymann, Jackson presented in Los Angeles, in January, 1928, a series of lectures on physiologic optics. The following year the ear, nose, and throat surgeons of California organized a short course in those specialties. Then, after a lapse of two years, Dr. Bernard Samuels gave at Los Angeles a midwinter course in the pathology of the eye.

For this course on pathology the "Los Angeles Research Study Club" was formally incorporated, and a combined two-weeks' course in ophthalmology and otolaryngology has been given every winter since then, with the coöperation of teachers from other parts of the United States as well as from abroad.

This year's attendance, including somewhere near one hundred medical guests from the Armed Forces, amounted to approximately four hundred. There was naturally a large attendance from the State of California, but, in all, twenty-seven states were represented, in the north, the south, the middle west, and the Atlantic seaboard.

It has been the custom to place most of the eye work of the Los Angeles course in the first week, and most of the ear, nose, and throat work in the second week. This year the eye events came to a close on Tuesday, January thirtieth. Decision will be made later as to whether in subsequent courses the individual weeks shall be separately allotted to the eye and to otolaryngology, respectively. Many of those present at the final eye luncheon expressed themselves in favor of this procedure.

In view of a recent Government pronouncement or request as to the holding of conventions during the remainder of the war, a conclusion as to whether the Los Angeles Research Study Club shall gather next winter will be reached later.

There can be no question that these meetings, diligently attended, with much use of notebooks, by a large body of specialists furnish a great stimulus to the better practice of ophthalmology and otolaryngology. Physicians who, in the absence of many colleagues overseas, are carrying an extremely heavy load of professional work and responsibility are in need not only of the stimulus afforded by such educational courses, but also of the brief period of relaxation from the daily grind. It is not easy for some of us to understand why there is any lesser degree of justification for travel applied to these purposes among overworked physicians and surgeons than for many other phases of the travel which, quite apart from military necessity, so constantly congests our rail and bus lines.

W. H. Crisp.

# ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

## CLASSIFICATION

- |  |  |
|--|--|
| 1. General methods of diagnosis                        | 10. Retina and vitreous                                |
| 2. Therapeutics and operations                         | 11. Optic nerve and toxic amblyopias                   |
| 3. Physiologic optics, refraction, and color vision    | 12. Visual tracts and centers                          |
| 4. Ocular movements                                    | 13. Eyeball and orbit                                  |
| 5. Conjunctiva   | 14. Eyelids and lacrimal apparatus                     |
| 6. Cornea and sclera                                   | 15. Tumors   |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries   |
| 8. Glaucoma and ocular tension                         | 17. Systemic diseases and parasites                    |
| 9. Crystalline lens                                    | 18. Hygiene, sociology, education, and history         |
|  | 19. Anatomy, embryology, and comparative ophthalmology |

### 7

#### UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

MacDonald, A. E. Boeck's sarcoid of retina—miliary form. *Trans. Amer. Ophth. Soc.*, 1943, v. 41, pp. 200-203.

Prompted by the findings in a case of reticular-cell sarcoma of both eyes, the author reviews his cases of "non-caseating tubercle of the retina" and reports what he regards as a true case of Boeck's sarcoid in miliary form. A woman aged sixty years gave a history of recurrent iritis in the right eye. The eye was observed for two years and was finally enucleated after severe pain. Clinically the iris showed a grayish mass, 5 mm. in diameter, with blood vessels leading to it. Posterior synechias were present. The left eye also had recurrent attacks of iritis with alternate vision limited to large objects. The original pathologic diagnosis of the right eye was sarcoma, but a review of the slide established a diagnosis of Boeck's sarcoid of the retina, by the finding of several masses of miliary sarcoid scattered through-

out the retina. (3 photomicrographs.)  
Carl D. F. Jensen.

### 8

#### GLAUCOMA AND OCULAR TENSION

Gaines, S. R. The value of central-field studies over the conventional type of visual-field studies. *New Orleans Med. and Surg. Jour.*, 1944, v. 97, Oct., p. 176.

The author reports six cases of glaucoma to illustrate some of the advantages of central over peripheral fields. More visual fields are taken on glaucoma patients than on patients with any other one condition. It is essential to find the earliest central changes and to watch their progress.

Theodore M. Shapira.

Guerry, Du Pont, 3. Angiodiathermy of the long posterior ciliary arteries and its use in the treatment of glaucoma. *Amer. Jour. Ophth.*, 1944, v. 27, Dec., pp. 1376-1393. (10 figures, references.)

Kronfeld, P. C. The standardization of so-called Schiötz tonometers. *Amer.*

Jour. Ophth., 1945, v. 28, Jan., pp. 34-37. (References.)

Masters, R. J. Notes on an operation for glaucoma. Amer. Jour. Ophth., 1944, v. 27, Dec., pp. 1371-1373.

## 9

## CRYSTALLINE LENS

Burky, E. L. The production of lens sensitivity in rabbits by brucella infection. Amer. Jour. Ophth., 1944, v. 27, Dec., pp. 1394-1395. (References.)

Hughes, W. F., Jr., and Owens, W. C. Extraction of senile cataract. Amer. Jour. Ophth., 1945, v. 28, Jan., pp. 40-49. (11 tables, references.) (Also Trans. Amer. Acad. Ophth. and Otolaryng., 1945, 49th mtg.)

Marshall, J. C. A case of polycythemia vera—extraction of both lenses. Brit. Jour. Ophth., 1944, v. 28, Oct., pp. 481-486. (See Section 10, Retina and vitreous.)

## 10

## RETINA AND VITREOUS

Benkwith, K. B. Early ophthalmic findings in a case of spontaneous subarachnoid hemorrhage of the brain. United States Naval Med. Bull., 1944, v. 43, Sept., p. 535.

A 33-year-old enlisted man became unconscious while he was complaining of headache, dizziness, and sudden ringing in the ears. The fundus of the right eye showed generalized attenuation of the retinal arterioles with very definite foci of spasm. The retinal veins were greatly distended and showed no arteriovenous constriction. Numerous round, pin-point, and flame-shaped hemorrhages gradually made their appearance in close proximity to the veins about 1 to 1.5 disc-diameters from the disc. The number increased,

and some coalesced to form large patches of hemorrhage. Later, large, nummular, disc-size, brick-red hemorrhages appeared one to two disc-diameters from the margin of the disc. As the volume of the hemorrhages increased they became dark red. The picture resembled central retinal thrombosis except that the hemorrhages lacked continuity with the disc. After thirty minutes of observation the left eye, too, showed arteriolar spasm and venous congestion but no hemorrhage or papilledema. The patient died three hours later. Autopsy showed massive subarachnoid hemorrhage over the right base of the brain, extending into the right optic sheath, and taking origin from the right anterior cerebral artery at the circle of Willis.

R. Grunfeld.

Clay, G. E., and Baird, M. Ophthalmoscopic classification of hypertensive diseases. Amer. Jour. Ophth., 1944, v. 27, Dec., pp. 1396-1403; also Trans. Amer. Ophth. Soc., 1943, v. 41, p. 205. (2 illustrations, references.)

Givner, Isadore. Clinical studies in angiospasm. Amer. Jour. Ophth., 1944, v. 27, Dec., pp. 1408-1412. (7 figures, references.)

Klien, B. A. Obstruction of the central retinal vein. Amer. Jour. Ophth., 1944, v. 27, Dec., pp. 1339-1354. (19 figures, references.)

Livingston, P. C. Visual problems of aerial warfare. 1. "Night": studies in the dark-adapted eye. The Lancet, 1944, v. 247, July 8, p. 33.

The swing of retinal function between rod and cone depends upon the amount of available light. It is known that in full moonlight cone function is dominant, with the assistance of rods

in an advanced but not complete state of adaptation. In good weather, night operations during the summer months are largely within the range of cone vision, suggesting the importance of due consideration of cone activity.

Normally the dark-adapted eye reveals a central scotoma corresponding to the size of the macula when tested by luminous objects below cone threshold. Measurement within small variations is 4 degrees wide and 5 degrees high. Variation in pattern demonstrates that recognition of objects whose illumination is gradually increased is greater and more rapid in those individuals who have the smallest scotoma, or the smallest pure cone area centrally. Likewise those with larger cone areas do poorest at the above recognition. Earlier experiment revealed that form recognition drops rapidly outside of 5 degrees from fixation in the dark-adapted eye. Enlargement of the blind spot is normally found on rod perimetry as is an interesting area of rod hypersensitivity between 12 and 18 degrees above the fixation point.

By these methods vitamin-A-deficient subjects show first an enlargement of the blind spot with early break through to the periphery. The normal central scotoma enlarges beyond physiologic limits, with later a concentric peripheral field contraction.

Rod sensitivity under anoxic conditions is found to vary widely in different subjects, the cause of which is still open to speculation. It has been found however that rod function is much less resistant to anoxemia than cone function. Owen C. Dickson.

MacDonald, A. E. So-called primary retinal tuberculosis. *Trans. Amer. Ophth. Soc.*, 1943, v. 41, pp. 197-199.

MacDonald adds another case of so-called primary retinal tuberculosis to the two cases previously reported by O'Sullivan and Story and by Hancock. The salient clinical feature of these two cases was the brilliant white reflex seen ophthalmoscopically. MacDonald's case had a similar reflex. Pathologic examination of his case revealed many mononuclear leucocytes in the iris and ciliary body. Two areas of caseation were seen in the retina. No giant cells were detected. MacDonald suggests that absence of giant cells was probably due to the early phase of the disease. (3 photomicrographs, references.) Carl D. F. Jensen.

Marshall, J. C. A case of polycythemia vera—extraction of both lenses. *Brit. Jour. Ophth.*, 1944, v. 28, Oct., pp. 481-486.

In a case of polycythemia vera a cataract was removed from each eye with excellent result. The primary form of polycythemia is distinguished from secondary forms and the characteristic fundus lesions are described. (References, 2 colored illustrations.)

Edna M. Reynolds.

Robertson, G. W., and Yudkin, J. Effect of age upon dark adaptation. *Jour. of Physiology*, 1944, v. 103, June, p. 1.

Disagreement as to the effect of age upon dark adaptation is considered due to differences in technique of measuring dark adaptation. In their measurement of dark adaptation (final rod-threshold) in 758 factory workers between the ages of 14 and 71 years, these investigators have found a progressive lowering of the power of dark adaptation with advancing years. The deterioration varies in different decades, the greatest being between fifty

and sixty. Progressive decrease in size of the pupil explains this deterioration quantitatively. Comparison of individual values with any normal standard is not considered satisfactory, since the normal range of dark adaptation is fairly wide. Francis M. Crage.

Sheard, C., Wagener, H. P., and Brunsting, L. A. Disturbances of visual adaptation and their clinical significance. *Proc. Staff Meetings Mayo Clinic*, 1944, v. 19, Nov. 1, p. 525.

The physiology and chemistry of dark adaptation and the criteria for its precise measurement are fully described.

Since vitamin A is a constituent part of the photosensitive pigment of the rods and, perhaps, also of the cones, night blindness can be produced in some instances through dietary avitaminosis A. Similarly night blindness will result in cases in which the vitamin A of the normal diet cannot be absorbed in the gastrointestinal tract, or in cases of malnutrition due to ulcerative colitis. On the other hand, feeding with large doses of vitamin-A concentration in frank conditions of vitamin-A deficiency will result in a recovery, which, however, may require weeks or months.

The tissues of the skin need carotene and vitamin A for their nourishment. Inadequate amounts of vitamin A in the blood and tissues may be found in certain skin diseases, such as pityriasis rubra pilaris and keratosis follicularis, and in these diseases the threshold of dark adaptation is very high. The liver is a great storehouse of vitamin A. Diseases of the liver, such as cirrhosis, are commonly associated with abnormal dark-adaptation curves.

The concentric contractions of the visual fields and the typical dark-

adaptation curves may be used clinically as points in differential diagnosis between primary pigmentary degeneration of the retina and inflammatory disorders. In some dyskeratotic diseases, although the threshold level of dark adaptation was found to be very high, the patients seemed to be well nourished and carotene was found in excess in the blood. We must assume that in these cases there was some disturbance of the mechanism for converting carotene into vitamin A, a process which takes place in the liver, although the commonly used liver-function tests failed to reveal any liver damage.

R. Grunfeld.

Stallard, H. B. Retinal detachment; 78 cases in the Middle East. *Brit. Med. Jour.*, 1944, Sept. 9, p. 329.

This article supplies statistics on 78 cases of retinal detachment, including 13 cases caused by cystic degeneration, 21 by choroido-retinal degeneration, 3 by myopia, 23 by civil trauma, and 18 by military trauma. All but two of the 78 cases were operated upon by combined surface and penetrating diathermy. The important features of the tears and special details in the cases operated upon are described. A table giving the postoperative results indicates 100 percent success in the cystic-degeneration and choroido-retinal-degeneration groups, both totalling 34 cases. Least favorable were the war trauma cases. Francis M. Crage.

## 11

### OPTIC NERVE AND TOXIC AMBLYOPIAS

Ford, Rosa. Retrobulbar neuritis (five cases) due to paranasal sinusitis. *Brit. Jour. Ophth.*, 1944, v. 28, Oct., pp. 511-515.

The five cases showed marked visual

defects. The duration of symptoms varied from two months to 29 years. All showed remarkable improvement in the vision following continuous drainage of the sinuses. In every case the sinusitis was silent.

Because of the prompt and steadily progressing visual improvement, the author believes that in these cases the term "pressure paresis of the optic nerve" is more suitable than "retrobulbar neuritis." (References.)

Edna M. Reynolds.

## 12

### VISUAL TRACTS AND CENTERS

Livingston, P. C. Visual problems of aerial warfare. 2. "Day": studies of photopic vision. *The Lancet*, 1944, v. 247, July 15, p. 67.

The organ of sight, when weak in some part, develops a compensatory mechanism, reflected in an adjustment of function within the cerebral cortex, which goes far to overcome the defect. It is not so much the presentation of an abnormal pattern resulting from an inherent defect which defeats the accuracy of analysis; it is an alteration in that pattern.

This accounts for the frequent tolerance of high astigmatic errors, and possibly the intolerance of small errors. Cases referred for refraction, especially under the stress of war, fall into two groups, (1) the tolerant, basically calm; and (2) the intolerant, those tuned to a higher cortical pitch. If a possible cause for visual irritation is discovered in the intolerant, it should be corrected. Indications for treatment are: (a) a sensation of relief emphasized by the patient with the correction; (b) great sensitivity to change of axis while rotating a small cylinder; (c) appreciation in an abnormally high

degree of small alterations in spherical power. Any of these suggest that effort in seeing has been transferred from the subconscious to conscious levels.

Factors influencing design of goggles for flying personnel include (1) adjustable interpupillary distance to allow quantity production; (2) use of safety glass to protect against shattering or flame; (3) design to give the greatest possible field of vision, accomplished partly by use of a double glass with two windows on each side, necessary because the safety glass cannot be ground on a high curve; (4) lightness to avoid the effects of gravity in flight.

Closed-cabin flying makes use of spectacles possible, with advantage in enlarged field and decrease in misting, but with the disadvantage of decreased protection.

Contact lenses have not been perfected to the place where they are of significant value except in isolated instances.

Glare has been controlled by use of "polaroid" or by Crookes B2 lenses.

Heterophorias can first be broken into two groups—those which are present from an early age, and usually stable, and those acquired, usually being unstable. The former commonly produce no symptoms while the latter do. The psychologic effect on the flier when elements of eyestrain develop are tremendous and difficult of evaluation. The consciousness of the need for effort in focusing results in discomfort, irritability, and eventually fatigue—a fatigue which may develop into a neurosis.

The author presents charts giving the results of orthoptic treatment in regard to exophoria, esophoria, and convergence insufficiency. Orthoptic study of 1000 cases of heterophoria re-

veals the greatest advantage from training in convergence weakness and uncomplicated exophorias. Those cases complicated by a strong psychologic factor do not respond readily to any training. Esophoria approaching strabismus, exophoria complicated by neglect, and hyperphoria exceeding 3 prism diopters offer serious barriers to treatment. In training of the heterophorias 242 of 700 have qualified as pilots, 214 have reached the solo flying stage, while 38 failed to pass the ground examinations. The remainder were reclassified for various reasons. In addition to the correction of the phoria, reinforcement of stereopsis is important because of the demands of present flying.

Central vision in the light-adapted eye appears little affected by anoxemia even up to the point of unconsciousness. Ophthalmoscopic examination reveals definite bluing of the disc under anoxemia. However, the effort required to maintain binocular concentration as tested by parallax cannot be sustained at high altitudes, while both accommodation and convergence decrease over a gradual curve with increase in anoxemia.

At extreme altitudes depression of the periphery of the visual field and localized regions of depression within the field occur. Further research may indicate whether this is due to nitrogen in the capillaries of retinal or of calcarine regions. The potential seriousness of the latter is apparent.

Owen C. Dickson.

### 13

#### EYEBALL AND ORBIT

Rogalski, T. A contribution to the study of anophthalmia with description of a case. *Brit. Jour. Ophth.*, 1944, v. 28, Sept., pp. 429-440.

A case of left anophthalmia with a left-sided harelip is reported. The left palpebral fissure was narrower and shorter than the right, as a result of fusing of the eyelids near the lateral angle. The medial angle of the palpebral fissure was bisected by a ridge of skin that began in a shallow groove connecting the orbit with the harelip. This ridge of skin ran upward and laterally into the conjunctival cavity. At the lateral end of the ridge a black spot was visible through the conjunctival covering.

Dissection of the right orbit showed the contents to be entirely normal. The left orbit, however, showed the left ophthalmic artery to be one third narrower than the right, and the left optic nerve was completely absent. The left optic foramen was smaller than the right and the ophthalmic artery was the only structure passing through it. The left orbit was distinctly smaller than the right. The left nasolacrimal canal was closed by a thin membrane at its nasal end.

Some of the contents of the left orbit were normal in appearance. The left lacrimal gland was well developed and the lacrimal puncta and canaliculi were present in both eyelids, but there was a bifurcation of the lower canaliculus to form two parallel channels.

The fundus of the conjunctival cavity was composed of dense fibrous tissue into which the orbital muscles were inserted in normal relative positions. No vestige of retinal structure, of optic nerve, of lens, or of hyaloid artery could be found in the left orbit.

Analysis of the contents of the left orbit showed that the mesodermal structures, situated external to the eyeball, were well developed, but that the eyeball itself was represented only by its anterior part, including vestiges of



cornea and sclera and of muscles and vessels. Among the parts to which the surface ectoderm gives rise, there were vestiges of everything but the lens. The lacrimal apparatus showed only slight maldevelopment.

The author suggests that the apparently independent development of the retina proper and the pigment epithelium, which have a common origin in the optic outgrowth, may be due to a difference in their blood supply.

Definitions of anophthalmia (complete and consecutive) and microphthalmia are given. The case presented belongs to the consecutive type of anophthalmia, in which the optic vesicle has certainly been formed but has atrophied in the very early stages, leaving as its vestige more or less malformed pigment epithelium. (6 figures.)

Edna M. Reynolds.

#### 14

#### EYELIDS AND LACRIMAL APPARATUS

Dimitry, T. J., and Mijares, I. The treatment of trichiasis with choline. *Amer. Jour. Ophth.*, 1944, v. 27, Dec., pp. 1425-1427.

Foster, John. Reconstruction of the lower lid by Hughes's method. *Brit. Jour. Ophth.*, 1944, v. 28, Oct., pp. 515-519.

Two cases of reconstruction of the lower lid following surgical removal because of basal-cell carcinoma unsuitable for irradiation are described. Because of the difficulty of anesthetizing the inner surface of the tarsal cartilage and conjunctiva, the author recommends the use of intravenous anesthesia. (8 photographs.)

Edna M. Reynolds.

Gordon, S., and Cragg, B. H. Congenital ectropion associated with bilat-

eral ptosis. *Brit. Jour. Ophth.*, 1944, v. 28, Oct., pp. 520-521.

Congenital ectropion of all four eyelids was associated with ptosis of the upper lids. The patient's father, two brothers, and one sister had similar defects, although not so marked. Lashes were normal in position and distribution, and there was no clinical or X-ray evidence of bony abnormality of the face. There was an alternating hyperphoria and alternating convergent strabismus of about 15 degrees. Vision was 6/12 in each eye and a high degree of hyperopic astigmatism was present. Lenses did not improve vision. The fundi were normal. A thin Thiersch was placed in each upper lid and Wolff grafts in the lower lids. Four months later, fascial slings to the frontalis muscle were placed to overcome the ptosis. (2 photographs.)

Edna M. Reynolds.

#### 15

#### TUMORS

Cordes, F. C. Bilateral metastatic carcinoma of the choroid, with X-ray therapy to one eye. *Amer. Jour. Ophth.*, 1944, v. 27, Dec., pp. 1355-1370; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42. (6 figures, bibliography.)

Jackson, Harvey. Orbital tumors. *Brit. Jour. Ophth.*, 1944, v. 28, Sept., pp. 472-478.

This was the subject for discussion at a meeting of the Royal Eye Hospital Clinical Society. Holmes Smith, the Chairman, pointed out that considerable interest had been caused by Dandy's book on orbital tumors in which he claimed that most orbital tumors had intracranial extensions and should be dealt with through the transfrontal approach by the neurosurgeon and not

merely tinkered with by ophthalmic surgeons in Krönlein operations.

Jackson remarks that the most frequent and commonly the earliest symptom is unilateral proptosis. Disturbances of vision are often realized simultaneously with protrusion of the eye. Pain fails to play a part in the average history of an orbital-tumor case. This surprising freedom from pain is probably due to the chronicity of the majority of the lesions. The development of a mass discernible to the patient is infrequent. Other, less frequent, clinical signs of orbital tumor are ptosis or edema of the lids, chemosis, cranial nerve palsies, audible bruits, and formation of a discharging sinus resulting from secondary infection. Ophthalmoscopic examination reveals papilledema in optic-nerve tumors and optic atrophy in other types. The duration of symptoms when fully established may be very great. A period of from 12 to 20 years is not exceptional. Radiologic verification is possible in a high percentage of cases.

It is the opinion of the author that the Krönlein operation has little to offer because of the limited field it provides, the unsightly scar that it leaves, and the diplopia which so often results. He prefers the transcranial operation, on which the orbit is explored through its roof by a trained neurosurgeon. The scar is hidden and a much wider field of exploration is secured. (References, 7 figures.)

Edna M. Reynolds.

Michaelson, I. S. Angioma of the retina. *Brit. Jour. Ophth.*, 1944, v. 28, Oct., pp. 522-526.

A case of angioma of the retina in which a tear as well as a tumor of the retina was present is reported. Surface diathermy was applied over the site of

the tumor and over the site of the tear. Visual acuity improved from 6/36 to 6/9 and the visual field was enlarged. The tumor appeared to be occluded. The feeding artery was normal in size and the draining vein could not be traced. (2 fields, 2 drawings.)

Edna M. Reynolds.

Town, A. E. Myxoma of the lower eyelid. *Amer. Jour. Ophth.*, 1945, v. 28, Jan., pp. 68-69. (One figure.)

Wolff, Eugene. A note on the rosettes, nature, and nomenclature of "glioma retinae." *Brit. Jour. Ophth.*, 1944, v. 28, Sept., pp. 448-450.

The columnar cells constituting rosettes are shown to be identical with the neuroepithelium of the third or fourth month of gestation. From the general form of the cells, and the presence of an external limiting membrane and diplosomes, there can be little doubt that the rosettes represent developing rods and cones. (5 figures, references.)

Edna M. Reynolds.

## 16

### INJURIES

Adamiuk, V. E. Therapeutic transplantation of skin. *Viestnik Oft.*, 1943, v. 22, pt. 4, p. 12. (See Section 2, Therapeutics and operations.)

Callahan, Alston. Eye injuries at an aircraft plant. *Jour. Med. Assoc. Georgia*, 1944, v. 33, Oct., p. 312.

A series of 404 eye injuries observed at an aircraft plant between January, 1942, and October, 1943, is presented with an evaluation of some of the clinical and therapeutic problems encountered. In most cases the traumatic agents in these cases were either particles of concrete or of similar substances or of various types of metal, particu-

larly aluminum and light alloys used in the construction of airplanes. A technical procedure evolved for the removal of minute foreign bodies from the cornea is described. Attention is called to the chemical sensitiveness of the eye to aluminum particles; and two cases of successful extraction of intraocular foreign bodies are described. Theodore M. Shapira.

Cherkasky, E. B. The best time to enucleate crushed eyes. *Viestnik Oft.*, 1943, v. 22, pt. 4, p. 28.

In grave war injuries leading to destruction of the eyeball there is usually severe conjunctival chemosis and ocular immobility caused by retrobulbar hemorrhage or orbital damage. Frequently the picture is mistaken for panophthalmitis and so the eyeball is eviscerated. Cherkasky is opposed to evisceration because he fears that uveal particles may be overlooked and become the source of sympathetic ophthalmia. Enucleation can be performed more easily and the postoperative recovery is smoother if the operation is done after the traumatic reaction subsides. He therefore urges delay of the operation for 20 to 25 days, until the orbital hemorrhage is absorbed and ocular motility is restored. Experience in war injuries has shown that frequently a foreign body passes through the eyeball and lodges in the cranium. For this reason such cases should be X-rayed before the eyeball is removed, and the latter should be done only when the conjunctival sac becomes free from purulent secretion. Ray K. Daily.

Cogan, D. G. Lewisite burns of the eye. *Jour. Amer. Med. Assoc.*, 1943, v. 122, June 12, p. 435.

Two instances of ocular lesions in man resulting from exposure to lewisite

droplets and gas are reported. The chief manifestations were in the superficial cornea, and caused severe epiphora, photophobia, redness, and swelling. There was no permanent damage. The relative mildness of the ocular lesions is probably accounted for by the prompt epiphora which flushes out the irritant, as contrasted with the latent period of mustard gas.

Robert N. Shaffer.

Golitsyn, N. D. Action of land mines, directed at the infantry, on the eye. *Viestnik Oft.*, 1943, v. 22, pt. 4, p. 30.

These mines striking at close range are very destructive, damaging the face, the eyes, and other parts of the body, and are frequently fatal. In 80 percent of the cases they produced complicated burns of the face with damage to the bones of the face and orbit, and perforations of the eyeball. Their effects differ from the injuries produced by mines directed at the artillery, in that the latter, exploding further away, do not produce burns. In 40 percent of the cases there were also injuries to the upper or lower extremities.

The burns of the face usually involve the lids, the conjunctiva, and the cornea, with the formation of vesicles and subsequent swelling of the conjunctiva and cornea, as well as maceration and desquamation of the epithelium. Of these injuries 24 percent were slight, 68 percent severe, and the others fatal. In the fatal cases there were perforating injuries of the eyeball, orbit, and skull, and prolapse of brain tissue.

The clinical course of slight injuries is as follows: On the first day the swelling and edema are so extensive that inspection is impossible without lid elevators. After one to three days of treatment the injured begin to discern figures and outlines. Burns of the

cornea are very severe. Some cases show rupture of the cornea, traumatic cataract, and prolapse of vitreous. The explosions also produce contusions, hemorrhages in the conjunctiva, vitreous opacities, and hemophthalmos.

Treatment was by the open method, painting the skin with 3 percent potassium permanganate, and irrigating the eyes with a 1 to 4000 solution. In perforating wounds sulfanilamide powder was used. Except in perforating injuries bandages were avoided.

Ray K. Daily.

Krol, A. G. Surgical procedure in lid injuries. *Viestnik Oft.*, 1943, v. 22, pt. 4, p. 6.

According to Russian data injuries of the lids constitute 11 percent of all ocular injuries. Incorrect handling of these injuries leads to the formation of thick scars, colobomas, and synechias between the lids and conjunctiva. The patient is thus left with a cosmetic deformity and disturbed function. Failure to do a primary repair of the lids, and waiting for cicatrization, keep the wounded in the hospital unnecessarily for months, and the results of late repair are not always satisfactory. Failure to undertake primary repair is usually due to fear of infection. But in reality the danger of infection of the lids is minimal, because the abundant vascularization of the tissues and the thinness of the muscle tissue insure excellent nutrition. War surgery has demonstrated that the earlier the repair of the lids is performed the better the results. Analysis of 64 patients, 23 of whom were operated upon within one to 22 days of the injury in field hospitals, and 41 at base hospitals from one to three months after the injury, shows that injuries of the lids should receive primary repair in field hospitals,

and when hospitalization is late they should have immediate repair and remain in the hospital until the sutures are removed. The wound should be repaired even if the wounded reach the hospital after a delay of 1 to 3 weeks, and one should never wait for complete cicatrization of the wound. In operating, every millimeter of tissue should be carefully saved. In wounds through the entire thickness of the lids the conjunctiva and the skin should be sutured separately, and the lids should be totally immobilized for four days with a binocular bandage. Postoperative physiotherapy is of value in reducing the density of the cicatrices.

Ray K. Daily.

Kronenberg. Bernard. A case of intralenticular foreign body with early removal. *Amer. Jour. Ophth.*, 1944, v. 27, Dec., pp. 1427-1428.

Mann, Ida. A study of eighty-four cases of delayed mustard-gas keratitis fitted with contact lenses. *Brit. Jour. Ophth.*, 1944, v. 28, Sept., pp. 441-447.

The cases reported were diagnosed on the history and on the finding of mustard-gas scars with corneal degeneration (fat and cholesterine), varicose conjunctival and corneal vessels, and avascular scars on the interpalpebral conjunctiva. Roughly half of the cases had a long quiescent interval between exposure and the beginning of the ulceration stage. The only complaint during this time was alteration of refraction. The recurring ulcers heal but leave faceted scars which gradually diminish visual acuity.

Wearing contact glasses does not entirely prevent breakdown, but in many cases retention of vision and continuance of work has been made possible for as much as seven years. In all but

two cases, moreover, there was great improvement in vision with contact glasses. Thirty-nine of the patients wear their contact glasses eight hours or more a day. Twenty of these patients have had one or more relapses since wearing the glasses. Five patients have been unable to wear contact lenses, and eight patients wear their lenses less than five hours a day. (One graph, 2 tables, references.)

Edna M. Reynolds.

Michaelson, I. C. Incomplete avulsion of the eye. *Brit. Jour. Ophth.*, 1944, v. 28, Sept., pp. 458-460.

The case is reported because of the remarkable functional recovery. A soldier assaulted the patient, and attempted to gouge out his right eye with a spike-ring. There was a clean-cut, oval, incised wound through the upper and lower lids, including the conjunctiva. The globe was proptosed between the edematous tissues and could not be replaced. All four recti muscles were completely severed from their global attachments. The vitreous showed extensive hemorrhage, which together with the corneal haze prevented a view of the fundus. The visual acuity was perception of hand movements.

Under general anesthesia the recti muscles were sutured to their insertions, the conjunctival wound was closed, and the lids were brought back in position. After seven weeks the vision was 6/24 and the vitreous had greatly cleared. After 16 months, when the patient was seen again, he was complaining of some diplopia when looking forward and to the left. The right eye showed some divergence and some limitation in adduction. The right eye showed a pronounced optic atrophy. With central acuity of 6/9, the visual loss was not in keeping with the

marked pallor of the disc. The field showed some concentric contraction and a small paracentral scotoma.

The right external rectus muscle was lengthened surgically. At the time of discharge, all movements of the eyes were good except that there was adduction of the right eye in binocular use. (One field, 3 figures.)

Edna M. Reynolds.

Mitzkevich, L. D. Wounds at the inner angle of the lids and treatment of the resulting defects. *Viestnik Oft.*, 1943, v. 22, pt. 4, p. 10.

In repair of injuries of the lower lid at the inner canthus, Mitzkevich pulls up the torn loose end of the lid into a pocket formed high up under the skin of the inner canthus, and sutures it there with two mattress sutures. The buried end of the lid should be denuded of the outer skin layers. This procedure fixes the lid firmly in its place and avoids the ectropion and eversion so commonly seen in end-to-end repair of such wounds. (Illustrations.)

Ray K. Daily.

Muraviev, B. G. A modification of Keller's method in localization of intra-ocular foreign bodies. *Viestnik Oft.*, 1943, v. 22, pt. 4, p. 37.

The author's modification consists in dividing the exposure time unequally, to produce two X-ray shadows of unequal intensity. The patient looks down for one-third of the exposure time, and up for two-thirds. If the lighter shadow on the roentgenogram is found below the denser one, the foreign body is located in the anterior ocular segment while if their position is reversed it is in the posterior ocular segment. This method may be used when equipment required for more accurate localizing methods is unavailable, and is suitable

for foreign bodies not less than 1 mm. in size.

Ray K. Daily.

Pfeiffer, R. L. Localization of intra-ocular foreign bodies by means of the contact lens. *Arch. of Ophth.*, 1944, v. 32, Oct., pp. 261-266.

The removal of magnetic foreign bodies by the hand magnet is somewhat replacing the grosser technique employing the giant magnet. This more refined technique calls for more accurate localization. With consummate care it is possible for a roentgenologist to localize a foreign particle in the eye with greater accuracy than the surgeon can utilize at operation.

Bone-free roentgenography, employing dental film, is of value both in the diagnosis and localization of fragments in the anterior 8 to 12 mm. of the eye. For more general use, localization is carried out by means of the Comberg contact lens. This lens differs from optical contact lenses in that it contains four lead markers to indicate the limbus. With the contact lens in place, two exposures are made, a posteroanterior and a lateral. These two exposures make it relatively easy to determine the position of the foreign body in relation to the four lead markers. The method of plotting the position graphically is described. The author states that this method is accurate, simple, easy to perform, and adaptable, and that it requires a minimum of apparatus. (7 figures, references.)

John C. Long.

Pierce, G. W. Some useful plastic procedures in ophthalmology. *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1944, 48th mtg., May-June, pp. 309-332.

After complete excision of an apparently small scar, an appalling defect often results. Only experience teaches

the best selection of materials for repair of the part. Nine illustrative cases are recorded.

A severe ectropion of the lower lid following a boiler explosion was successfully treated with a skin graft from the back of the ear. Ptosis following a conjunctival burn complicated by orbital infection was improved by insertion of two subcutaneous fascia-lata strips. These extended from slightly below the tarsal fold to a half inch above the brow.

Obliteration of the cul-de-sac following a lime burn was remedied by a thin Thiersch-graft inlay fitted on a bisected wax mold. Scar tissue was previously completely excised. A similar problem was solved by scar-tissue excision and the restoration of the lower cul-de-sac by mattress sutures from the conjunctiva downward through the lower lid.

Entropion was improved by a modified Machek-Blaskovics operation. Extensive melanoma of the lower lid was excised and the lid repaired with a pedicled flap from the temporal end of the upper lid.

After a bullet wound, the orbit was reconstructed with a Thiersch graft splinted with dental modeling-wax. An acrylic plug was placed in the orbital apex on which rested the prothesis. A preserved refrigerated cartilage-implant was placed subperiosteally in the floor of the orbit to raise the eyeball and relieve diplopia following a crushing fracture of the malar bone. (21 photographs, 34 diagrams.)

Charles A. Bahn.

Popov, M. Z. Pathogenesis of the fundus changes in complicated cranio-cerebral injuries. *Viestnik Oft.*, 1943, v. 22, pt. 4, p. 19. (See Section 12, Visual tracts and centers.)

Protopopov, B. V. Signal forceps for removal of nonmagnetic intraocular foreign bodies. *Viestnik Oft.*, 1943, v. 22, pt. 4, p. 29.

The author has devised a forceps connected with an electric current and a small light bulb. A piece of metal between the blades of the forceps closes the circuit, the fact being indicated by the lighting of the bulb. The foreign body is localized by X ray. After a scleral incision over the foreign body the forceps is introduced into the wound and attempts are made to grasp the foreign body. In one case the lamp was lit immediately after the introduction of the forceps and the foreign body was easily extracted. In three cases it was removed after a long search. In two cases the attempt failed. In one of these the eyeball was enucleated and it was found that the foreign body had not been correctly localized by the X ray, and was enveloped by a dense exudate so that the forceps could not come into contact with it. In the second case the foreign body had been in the eyeball for a month, and had also probably become firmly encapsulated.

Ray K. Daily.

Sherman, A. R. Eye injuries in industry and determination of their disability. *Jour. Med. Soc. New Jersey*, 1944, v. 41, Sept., p. 332. (See Section 18, Hygiene, sociology, education, and history.)

Smelanski, R. I. Orbital foreign bodies. *Viestnik Oft.*, 1943, v. 22, pt. 4, p. 24.

In industrial injuries orbital foreign bodies are rare, because a sharp metallic particle usually penetrates and becomes arrested within the eyeball. Foreign bodies in the orbit result from double ocular perforations, and it is

generally agreed that they are best left alone. In war injuries the foreign bodies are large, and penetrating at a great velocity they are powerful enough to pierce the bony walls of the orbit, and sometimes of both orbits, at times missing the eyeball. The important symptoms due to intraorbital foreign bodies are exophthalmos, limitation of ocular motility, ptosis, edema of the upper lid, and edema or chemosis of the conjunctiva. Chemosis is a very important symptom, and the persistence of chemosis without inflammatory symptoms is very suggestive of the presence of an intraorbital foreign body. The ocular symptoms are those of contusion; paralysis of the sphincter, iridodialysis, vitreous hemorrhages, and ruptures of the choroid and retina. Localization of the foreign body is very difficult even with X ray, and so is its extraction, even with the giant magnet. A foreign body held firmly by the tissues of the orbit or its bony walls is not dislodged by the electromagnet. Surgery in such cases should not be undertaken hastily. While it is recognized that all intraocular foreign bodies should be removed immediately and there must be special indications to justify delaying the operation, in intraorbital foreign bodies the situation is reversed. Surgery should not be undertaken without definite indications. These are symptoms of beginning orbital infection, pressure symptoms caused by a large fragment, and beginning meningitis. Extractions should be undertaken after careful X-ray localization, and one should have available a giant magnet and a radio-localizer. The author's material consisted of 47 surgical cases. There were 41 metal fragments, 4 bullets, and in two cases the orbit contained pieces of bone; in one case it was the bone of a horse blown up by a mine, and in the

other a piece of the patient's own leg. The foreign bodies were localized as follows: 24 in the anterior portion of the orbit, 24 in the posterior portion, and 3 in the ethmoids. The eyeball was saved in 32 cases; in 29 with satisfactory vision and in 9 without vision. In 15 cases the eyeball was gravely injured. Of 45 foreign bodies, 30 were extracted through orbitotomies, one case by means of Kroenlein operation. Twenty-two foreign bodies were extracted with the giant magnet, and 6 with the aid of the radio-localizer.

Ray K. Daily.

Wiener, Meyer. The treatment of recent injuries to the eye and adnexa. *Trans. Amer. Acad. Ophth. and Otolaryng.*, 48th mtg., 1944, July-Aug., pp. 425-435.

All bleeding should be stopped before anything else is done. Digital compression, if properly carried out, will always temporarily control the major part of the bleeding. All bleeding vessels should be tied with silk ligatures cut short and left buried. Blood transfusions are indicated if the patient is in shock. General anesthesia may be necessary during the process of cleaning and preparing the wound. The cutting away of all lacerated and mashed tissues as was generally practiced during World War, I has given way to more conservative methods. Wounds must not be disturbed too often for inspection. Adequate tetanus toxoid should always be promptly administered in deep wounds, especially if the opening is small. Gas-gangrene serum is indicated if the risks justify. Necrotic material and pus should be eliminated before administering sulfonamide therapy. Primary wound closure is usually dangerous, and with few exceptions wounds should be left open. Not more

than 10 gm. of sulfanilamide should be used locally on any patient within a 24-hour period.

In severe heat-burns of the body, intravenous plasma should be used immediately. Avoid débridement or cleansing, using only sterile boric-acid strips secured by pressure bandages. Skin grafts, if necessary, should be used promptly. Granulation tissue should be removed. In perforating cuts of the lids, avoid loss of marginal conjunctiva.

In deep lid cuts, deep sutures should be used before suturing the skin. Patients requiring plastic repair should receive only prophylactic measures by eye surgeons not trained in plastic surgery. These patients should only be operated upon where experienced plastic surgery is available.

Generally speaking, magnetic intraocular foreign bodies are best removed with a powerful magnet and through the sclera. The scleral incision should be made with a very sharp cataract knife, and should be considerably larger than the estimated diameter of the foreign body, and as near the localized point as possible.

All injuries to the ciliary body produce eyes potentially subject to sympathetic ophthalmia. Enucleation is advised at the first sign of eyeball shrinkage, such as pitting of the injured eye. Scleral ruptures practically always mean loss of the eye. Retinal detachment due to traumatism responds especially well to electric coagulation. Iris prolapses should be excised and not replaced. If possible, wait until all irritation has subsided before operating on perforating lens injuries. Dislocated lenses, unless removed, nearly always result in increased intraocular tension and loss of the eye.

Conjunctival and corneal burns due



to alkalies or acids should be treated by prompt flushing of the conjunctival sac with water, using considerable force. In superficial burns, use cool compresses; in deep burns from lye or other escharotics, warm applications should be used. In lye burns, as long as the conjunctiva and underlying sclera remain red, one need not fear more severe damage to the cornea than exists. Pickrell's solution of 3 percent sulfadiazine in 8 percent triethanolamine sprayed over the surface of heat burns involving the face or lids seems the best immediate treatment thus far used. First aid in gas burns consists of several minute irrigations with any bland nonirritating solution. Use atropine if the cornea is involved; also sulfathiazole ointment or jelly to help prevent secondary infection. Lewisite burns should be treated by irrigation with one or two percent sodium-bicarbonate solution. (References.)

Charles A. Bahn.

## 17

### SYSTEMIC DISEASES AND PARASITES

Campbell, A. M. G., and Cross, A. G. Ocular neurosis. *Brit. Jour. Ophth.*, 1944, v. 28, Aug., p. 394.

The incidence of ocular neurosis in wartime is estimated at 34 percent, as compared with 15 to 16 percent in peacetime. Fourteen cases are reported, and the fact is emphasized that the basis of a neurotic reaction is any factor which induces an abnormal awareness of the ocular mechanism. Most of the cases reported are of chronic anxiety neurosis. The author suggests better education of the public, to bring about an intelligent realization of the strength and potentialities of the normal eye, and eradication of the belief that close study and working in artificial light damage the eyes.

Edna M. Reynolds.

Chesney, A. M., and Woods, A. C. Further observation on the relation of the eye to immunity in experimental syphilis. 2. The development of immunity after primary intracorneal inoculation. *Jour. Exper. Med.*, 1944, v. 80, Nov. 1, p. 357. (See Section 6, Cornea and sclera.)

Chesney, A. M., and Woods, A. C. Further observations on the relation of the eye to immunity in experimental syphilis. 3. The influence of a nonspecific inflammatory reaction in the cornea on the development of immunity in that tissue after intratesticular inoculation. *Jour. Exper. Med.*, 1944, v. 80, Nov. 1, p. 369. (See Section 6, Cornea and sclera.)

Dodds, G. E. Mucocoele of maxillary antrum. *Brit. Jour. Ophth.*, 1944, v. 28, Oct., pp. 510-511.

A mucocoele of the left maxillary antrum is described and illustrated. Definite proof of the diagnosis could not be obtained. (2 photographs.)

Edna M. Reynolds.

Friedenwald, J., and Buschke, W. The effects of excitement, of epinephrine, and of sympathectomy on the mitotic activity of the corneal epithelium in rats. *Amer. Jour. Physiology*, 1944, v. 141, July 1, p. 689. (See Section 6, Cornea and sclera.)

Gözcü, N. I. Retinal hemorrhages as complications of malaria. *Göz Klinigi*, 1944, v. 1, no. 5, p. 187. (See Section 10, Retina and vitreous.)

## 18

### HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Alvis, B. Y. Defective vision in industry. *Industrial Med.*, 1944, v. 13, July, pp. 537-539.

Industrial efficiency of groups of workers has a definite relation to the adequacy of their vision. Workers doing superior work for which their visual equipment theoretically or actually is not ideal compensate for their visual handicap by the factors of superior intelligence and training and experience. We must know the shortcomings of the workers so that they are not assigned tasks for which they do not possess the essential visual faculty. Safety and efficiency on the job are to be maintained, and danger to life and property from faulty vision must be avoided. The "art of seeing" is a composite of visual attributes including visual acuity, fusion and stereopsis, muscle balance and coordination, color appreciation, range of accommodation, and condition of visual fields. It is advisable to keep a record of the employee's ability in each of these components, first to direct placement, but also as a matter of record in case claims arise following accidental injury.

M. Lombardo.

thalmic specialist and a sergeant optician, and full equipment for ophthalmic examination and treatment, including a giant magnet, diathermy, a generator, lenses, frames, and the necessary optical mechanical equipment.

The prompt treatment of minor eye casualties, including superficial foreign bodies, abrasions, conjunctivitis, and the remedy of damage or loss of spectacles, enables many men to return immediately to their fighting units. Thus, during a battle of El Alamein one Forward Ophthalmic Unit dealt with 590 eye or spectacle casualties in one week. Of these, 180 were serious injuries and were treated and evacuated to the base, while 410 were returned to their units the same day. To the early removal of intraocular foreign bodies, to prompt operation on corneal and scleral wounds or on prolapse of uveal tissue soon after the injury, is attributed a great deal of sight saving, although some credit must be given to advances in surgery.

R. Grunfeld.

Crisp, W. H. Edward Jackson's place in the history of refraction. (First Jackson Memorial Lecture.) *Amer. Jour. Ophth.*, 1945, v. 28, Jan., pp. 1-12; also *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1944, 49th mtg., p. 47. (Bibliography.)

Duke-Elder, Stewart. Caring for the eyes of Britain's Army. *The Military Surgeon*, 1944, v. 95, Aug., p. 105.

The ophthalmic services of the British Army have become revolutionized in the course of the war. At the periphery are the Mobile Ophthalmic Units, one to each corps, serving the needs of the front line. These units are carried on two trucks, one acting as an ophthalmic consulting room, the other as a spectacle shop. They carry an oph-

Gutzeit, E. E. Medical-social aspects in the rehabilitation of the blind. *Outlook for the Blind*, 1944, v. 38, Sept., p. 196.

The number of blind persons who will benefit by the Barden-La Follette Act is not large. Only 15 to 25 percent are employable, that is from 34,000 to 56,000 persons. The remainder are disqualified by advanced age, household responsibilities, or handicaps other than blindness.

In order to guide the blind to vocational rehabilitation it is necessary to know what practical use can be made of the various degrees of vision from 0 to 20/200. For instance, what can be expected of a man whose sight has been restored by cataract surgery but who consequently has lost his accom-

modation? What work may a glaucoma patient do, or one with retinitis pigmentosa who has lost considerable peripheral field? What precautions must a diabetic patient observe in order not to lose more vision?

R. Grunfeld.

Hamilton, J. B. The incidence of eye disease in the Australian imperial forces, Middle East. *Brit. Jour. Ophth.*, 1944, v. 28, Aug., pp. 383-393.

This report covers 5,650 diseased conditions seen in 3,638 patients during 1941 and 1942. The report is compared with a previous publication by the author of 14,317 diseased conditions in a survey of 6,458 private patients seen in Tasmania between 1931 and 1939. The figures and percentages of civil and war eye disease are arranged in five tables for comparative study. A general survey shows that there is less eye disease in military than in civil life. There are fewer eye injuries, and on the medical side, the percentages of iritis, keratitis, choroiditis, retinitis, and retinal detachment are also lower in the army than in civil life.

The refractive errors in the army show a percentage of 64 as compared with 95 percent in civil life. Astigmatism was the commonest refractive error, being found in about 40 percent of the army cases. Muscular anomalies were recorded in 20 percent of the army cases as compared with 24 percent of the civilian cases. Hasty recruiting is the explanation advanced for the high percentages of refractive errors and muscular anomalies. There were as many amblyopias ex anopsia in army personnel as in civil life, which also shows hasty recruiting. Iritis and iridocyclitis were very rare in the army, possibly because of the early use of sulfanilamide by mouth. Not one case of

trachoma was found in the entire series. (5 tables.) Edna M. Reynolds.

Krakov, C. V. Physiologic optics in the Soviet Union for twenty-five years. *Viestnik Oft.*, 1942, v. 21, pt. 6. p. 42.

While studies in physiologic optics in Russia date from the last century, it was only after the Revolution that institutions devoted exclusively to the study of physiologic optics were established. The institutions established during the last 25 years in Moscow are: the Lazarev Institute of Biophysics with an extensive division for the study of vision; the laboratory of psychophysiologic sensations at the Institute of Psychology; the laboratory of physiologic optics at the Helmholtz Institute; the laboratory of physiologic optics at the Soviet Institute of Experimental Medicine; and the laboratory of technical illumination of the Safety Institute for Workers. In Leningrad is the laboratory of physiologic optics at the National Institute of Optics. Studies in the physiology of vision are being pursued in the department of physiology at the Military Academy of Medicine, in the technical illumination division of the Leningrad Institute for the Protection of Work, in the experimental laboratory of the Leningrad Ophthalmologic Institute, and in the First Leningrad Medical Institute. The Ukraine Ophthalmologic Institute pursues similar studies. Over a thousand publications have been issued in this field, and two volumes on problems of physiologic optics. Ray K. Daily.

Lake, M. M. Some observations on the problem of rural rehabilitation. *Outlook for the Blind*, 1944, v. 38, Oct., p. 221.

Among the branches of agriculture in which the blind may become suc-

cessful, are poultry raising, dairy farming, gardening, and marketing of products. But in each case the blind man needs assistance and supervision by his wife or some other member of the family. R. Grunfeld.

Livingston, P. C. Visual problems of aerial warfare. 1. "Night": studies in the dark-adapted eye. *The Lancet*, 1944, v. 247, July 8, p. 33. (See Section 10, Retina and vitreous.)

Livingston, P. C. Visual problems of aerial warfare. 2. "Day": studies of photopic vision. *The Lancet*, 1944, v. 247, July 15, p. 67. (See Section 12, Tracts and centers.)

Sanders, T. E. A method for the projection of eye specimens. *Amer. Jour. Ophth.*, 1944, v. 27, Dec., pp. 1424-1425.

Sherman, A. R. Eye injuries in industry and determination of their disability. *Jour. Med. Soc. New Jersey*, 1944, v. 41, Sept., p. 332.

Eye injuries in industry differ from other injuries only in that one must keep more detailed records on which he can base necessary reports. The author discusses various types of injury, common and uncommon. He also relates how the Medical Society of New Jersey standardized methods by which the percentage loss of vision was to be determined. This method was accepted by ophthalmologists and by the compensation courts of New Jersey. Other methods are also given. A method of determining visual-field loss is added. Theodore M. Shapira.

Shortley, M. J. Vocational rehabilitation for the visually handicapped. *Outlook for the Blind*, 1944, v. 38, Sept., p. 186.

The author, as Director of the Office of Vocational Rehabilitation of the Federal Security Agency in Washington, outlines the federal and state program of vocational rehabilitation. Until 1920 only private organizations were interested in the rehabilitation of the handicapped. The first vocational rehabilitation law was enacted in 1920. In the next 20 years 210,000 handicapped were rehabilitated throughout the United States. Federal funds were limited and the state legislatures were indifferent. Under the Barden-La Follette Act, which became law in July, 1943, federal funds are now available for medical and vocational diagnoses, vocational counseling, physical restoration, and vocational training with maintenance during training. All handicapped persons are eligible irrespective of financial status. Only static conditions may be treated and the medical services must be of such nature that they may reduce or eliminate substantially the employment handicap.

There are in this country about 230,000 blind persons, to whom must be added the partially sighted. The latter may be grouped as follows: (a) 25 percent general loss of vision, (b) loss of one eye, (c) 20/60 corrected vision in the better eye, (d) better than 20/60 vision if progressive. R. Grunfeld.

Sitchevska, Olga. Heredity and eye diseases. *Med. Women's Jour.*, 1944, v. 51, Oct., p. 17.

About 14 percent of blindness among children of school age and 10 percent of adult blindness are due to heredity. However, due to the complexity of hereditary mechanisms it is difficult to give definite advice to patients affected with serious eye diseases which have a hereditary tendency.

The dominant character of inheri-

tance in which half of the offspring will be diseased is manifest in congenital night blindness, blue sclerotics with bone fragility, ptosis, many types of cataract, ectopia lentis, coloboma of the iris, aniridia, familial types of corneal opacities, and certain types of myopia. In these, when two normal individuals marry, their progeny will never inherit the disease.

The recessive character is shown by retinitis pigmentosa, albinism, anophthalmos, buphthalmos, hydrophthalmos, and infantile glaucoma. Consanguinity is considered an important factor in the production of retinitis pigmentosa and albinism.

The most common type of transmission of the sex-linked character is that in which the descent is through the X chromosome, therefore dominant in the

male and recessive in the female. This type of transmission is present in Leber's optic atrophy, congenital color blindness, congenital nystagmus, and hemophilia. Sons of affected fathers are normal and do not transmit the disease, while the daughters appearing normal but possessing the recessive tendency transmit the condition to the males.

Microphthalmos may be either a recessive or a dominant characteristic in a hereditary strain. Some feel that microphthalmics should not reproduce and that no more children should be allowed parents of a microphthalmic child.

Keratoconus likewise may show definite hereditary tendencies, as may Groenouw's nodular keratitis.

Owen C. Dickson.

## NEWS ITEMS

Edited by DR. DONALD J. LYLE  
904 Carew Tower, Cincinnati 2

News items should reach the editor by the twelfth of the month

### DEATHS

Dr. Scott C. Applewhite, San Antonio, Texas, died November 17, 1944, aged 68 years.

Dr. Aaron Brav, Philadelphia, Pennsylvania, died December 2, 1944, aged 69 years.

Dr. Joseph H. Crampton, Seattle, Washington, died November 9, 1944, aged 60 years.

Dr. John S. Gordon, Milwaukee, Wisconsin, died December 6, 1944, aged 56 years.

Dr. John E. Hiess, Perry, Oklahoma, died December 14, 1944, aged 60 years.

Dr. Jacob O. Hoffman, Harrisonburg, Virginia, died September 4, 1944, aged 84 years.

Dr. Frederick P. Parker, Saint Louis, Missouri, died November 18, 1944, aged 75 years.

### MISCELLANEOUS

The complete program for the Ophthalmological Seminar which will be held April 19, 20, 21, 1945, in Atlanta, in honor of the memory of Dr. Abner Wellborn Calhoun, is as follows:

#### THURSDAY, APRIL 19, 1945

4:00 p.m.—Emory University Hospital Auditorium. Dr. W. I. Lillie, Philadelphia, "Clinical significance of diplopia."

5:00 p.m.—Reception—A. W. Calhoun Medical Library.

7:00 p.m.—Academy of Medicine. Buffet supper—Guest of Women's Auxiliary.

8:00 p.m.—Academy of Medicine. Dr. Frank B. Walsh, Baltimore, "Clinical diagnostic features of migraine."

9:00 p.m.—Dr. Walter I. Lillie, "Neuro-ophthalmology with special reference to retrobulbar neuritis."

#### FRIDAY, APRIL 20, 1945

10:00 a.m.—Grady Hospital Senior Lecture Room. Dr. Frank B. Walsh, "The ocular signs of subdural hematoma in infants and adults."

11:00 a.m.—Dr. William Benedict, Rochester, Minnesota, "Exophthalmos."

1:00 p.m.—Luncheon—Guest of Grady Hospital.

3:00 p.m.—Academy of Medicine. Dr. Parker Heath, Detroit, "Random notes on ocular surgery."

4:30 p.m.—Dr. William Benedict, "Discussion of superficial keratitis."

6:30 p.m.—Biltmore Hotel. Dinner—Guest of Emory University.

8:00 p.m.—Academy of Medicine. Dr. Parker Heath, "Some recent advances in ocular therapeutics."

9:00 p.m.—Dr. John Dunnington, New York City, "Surgical treatment of vertical deviations."

#### SATURDAY, APRIL 21, 1945

10:00 a.m.—Academy of Medicine. Dr. Harry Gradle, Chicago, "Observations on the surgery of retinal detachments."

11:00 a.m.—Dr. John Dunnington, "Plastic surgery of the lids."

1:00 p.m.—Biltmore Hotel. Luncheon—Guest of Eye Department.

2:30 p.m.—Academy of Medicine. Col. Derrick Vail, Cincinnati, "Ophthalmology in war."

3:30 p.m.—Dr. Harry Gradle, "Ocular complications of polyarthritis."

4:30 p.m.—Dr. John Dunnington, "Use of penicillin in ophthalmology."

6:30 p.m.—Biltmore Hotel. Dinner—Guest of Emory University.

8:00 p.m.—Academy of Medicine. Dr. Harry Gradle, "Surgical treatment of glaucoma."

9:00 p.m.—Col. Derrick Vail, "Ophthalmology in war."

The Saint Louis Ophthalmic Society and the Department of Ophthalmology of Washington University offers an eight-months' course for orthoptic technicians. The theoretical instruction will be given at the Oscar Johnson Institute and the practical work at the Saint Louis Ophthalmic Laboratory. The course is limited to three students; tuition \$300. For information write to the Saint Louis Ophthalmic Laboratory, Missouri Theatre Building, 634 North Grand Boulevard, Saint Louis 3, or to Dr. Lawrence T. Post, 640 South Kingshighway, Saint Louis 10.

The eleventh annual postgraduate course of the Virginia Society of Ophthalmology and Otolaryngology was held at the University of Virginia Department of Medicine, Charlottesville, December 5th to 8th. Participating in the program were: Drs. Paul H. Holinger, Russell L. Cecil, Frederick M. Law, John R. Page, Joseph D. Kelly, McLemore Birdsong, Marion Lawrence White, Jr., James W. White, Wendell L. Hughes, William E. Fry, and Paul A. Chandler.

According to a recent announcement the University of Illinois College of Medicine received an anonymous gift of \$20,000 for visual aid studies.

A course in slitlamp microscopy of the living eye combined with a course in glaucoma surgery was given by the Committee on Graduate Education of the Allegheny County Medical Society on February 12th to 14th. The course was conducted by the department of ophthalmology of Montefiore Hospital under the direction of Dr. Harvey E. Thorpe and his associates.

#### SOCIETIES

The Brooklyn Ophthalmological Society held its regular meeting on February 15th at the Towers Hotel, Brooklyn. A paper on "Wernicke's disease—encephalitis hemorrhagica superior" was presented by Dr. Daniel Kravitz and a discussion by Dr. Robert H. Stockfisch followed. The scientific program was concluded with a lecture by Dr. Raymond L. Pfeiffer on "Exophthalmos."

The Kansas City Society of Ophthalmology and Oto-Laryngology will present an oil painting of Dr. Hal L. Foster to the American Academy of Ophthalmology and Otolaryngology at the fiftieth anniversary of the Academy, provided the 1945 session is held. Dr. Foster founded the national organization at a meeting in Kansas City in April, 1896.

At the January dinner meeting of the Cleveland Ophthalmological Club, Dr. Harold Francis Falls of the Department of Ophthalmology, University of Michigan, spoke on "Ophthalmic syndromes." The lecture was illustrated with

lantern slides showing unusual cases which the speaker had observed.

The following officers have been elected by the Sociedad de Estudios Clínicos de la Habana for the biennium 1945-46: president, Dr. Julio F. Schulte Vicedo; vice-president, Dr. José Lastra Camps; secretary, Dr. Frank Canosa Lorenzo; vice-secretary, Dr. Luis Rodríguez Baz; treasurer, Dr. Luis Ortega Verdes; vice-treasurer, Dr. Alvaro Silva López del Rincón.

#### PERSONALS

Dr. Harry S. Gradle, President of the Pan-American Congress of Ophthalmology, who is now in South America on a speaking tour, has found all of the leading ophthalmologists in Latin America enthusiastic about the next meeting of the Congress, which is scheduled for November 25-30, 1945, in Montevideo, Uruguay. He has met with many of the South American ophthalmologists of the Congress and with the arrangements committee in Montevideo, and reports that the program is set up and all preliminary arrangements are completed.

Dr. Earling W. Hansen, Professor of Ophthalmology at the University of Minnesota School of Medicine, gave an instructive talk on "The mechanism of uveitis" at the November dinner meeting of the Cleveland Ophthalmological Club.

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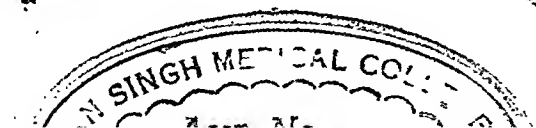
JUST BEFORE GOING TO PRESS WORD WAS RECEIVED THAT COL. DERRICK VAIL HAD BEEN APPOINTED CHIEF CONSULTANT IN OPHTHALMOLOGY, SURGERY DIVISION, IN THE SURGEON GENERAL'S OFFICE. THIS APPOINTMENT WILL PERMIT COLONEL VAIL TO RESUME A PART OF HIS EDITORIAL DUTIES ON THIS JOURNAL. THE STAFF WELCOMES HIM MOST HEARTILY AND CONGRATULATES HIM ON HIS NEW APPOINTMENT AND ON WORK WELL DONE OVERSEAS FOR THE LAST TWO AND A HALF YEARS. HIS ADDRESS IS COL. DERRICK VAIL (MC) 0491780, OFFICE OF THE SURGEON GENERAL, 1818 N STREET N.W., WASHINGTON, D.C.

# AMERICAN JOURNAL OF OPHTHALMOLOGY

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## RECURRENT EROSION OF THE CORNEA\*

PAUL A. CHANDLER, M.D.

*Boston*

Recurrent erosion of the cornea is one of the most remarkable disorders of the eye. A patient suffers an injury to the cornea, perhaps a real abrasion with extensive loss of epithelium, perhaps a very slight trauma to the epithelium. The cornea heals in a period of hours or days, depending on the extent of the injury, and the patient becomes symptom-free, with the eye showing no resulting opacity or other sign of injury. At some later date (days, weeks, months, or even years afterward) there is a sudden development of symptoms of greater or less severity, without any obvious cause. The symptoms subside, only to recur again and again, sometimes over a period of years at various intervals. Almost invariably each attack occurs at some time between 2 and 4 a.m. or when the eyes are first opened in the morning. At the time of a recurrence the patient suffers pain, photophobia, lacrimation, and blepharospasm. The objective signs vary from a faint clouding of the epithelium, best visible with the reflected light of the ophthalmoscope, in the mildest cases, to a large corneal bulla or erosion in the most severe. Between these two extremes one may find various grades of disturbance.

A certain type of injury to the cornea seems to predispose to recurrent erosion—notably sudden sharp abrading injuries, such as a scratch from a fingernail, from

a branch of a tree or plant, or from the edge of a piece of paper. Seldom does recurrent erosion follow removal of a foreign body of the cornea, or wounds extending into the stroma. Moreover, it seldom occurs if there is infection of the original abrasion with resulting formation of a scar. On the other hand, the whole symptom-complex may occur in eyes that have suffered no known preceding trauma.

The disorder was first described in ophthalmic literature by Hansen in 1872,<sup>1</sup> under the name "Intermittent neuralgic vesicular keratitis." Von Arlt, in 1874,<sup>2</sup> was the first to use the term "recurrent erosion of the cornea," the name by which the condition has since generally been known. Von Szily, in 1900,<sup>3</sup> in a paper entitled "Ueber Disjunction des Hornhautepithels" gave the most comprehensive discussion of the disorder, and pointed out the principal features of the disease.

From my own experience and from a review of the literature listed below, it is possible to distinguish two main forms of the disorder, for which I suggest the terms macro- and microform. Although the underlying pathology is probably identical in both forms, the clinical features, as a rule, are different enough to warrant separate discussion.

## TYPES

*The Macroform.* As a rule, in this form there is a history of an extensive traumatic abrasion of the cornea. Recur-

\*Read at the eightieth annual meeting of the American Ophthalmological Society, at Hot Springs, Virginia, May 29-31, 1944.

rences usually take place at long intervals, weeks, months, or years, with signs and symptoms similar to those of the original attack. This is the easily recognizable form, not very common, but familiar to most ophthalmologists, and many times reported in the literature. The involved area in a given recurrence is usually similar in location and extent to that of the original injury, but occasionally it does not correspond exactly in either location or extent.

*The Microform.* In this form there is usually, but not always, a history of corneal injury. As a rule the injury is a very slight one, for which the patient may not seek medical advice. The first attack usually occurs soon after the injury, often in a few days, in a few weeks at most. There is pain, lacrimation, and a sense of difficulty in opening the eyes. In from five minutes to an hour or two all symptoms subside. The attacks are much milder and of much shorter duration than those of the macroform, but occur far more frequently, sometimes every night or morning. When the patient presents himself with such a history, the eye is usually white and quiet, and the patient is symptom-free. The cornea appears clear and lustrous. If the last attack has occurred some days previously, it may be impossible to demonstrate any lesion of the cornea by any method of examination, including the use of the slitlamp. If the attack has occurred the night before, in the mildest cases, or even some days before, in the more severe, it is always possible to demonstrate a corneal lesion. This is small, usually 1 to 2 mm. in diameter, and may be anywhere in the cornea, though as a rule not within 2 mm. from the limbus. The disturbance may very easily be overlooked by ordinary methods of examination. Several of the earlier writers,<sup>4,5,6,7,8,9</sup> unable to discover any corneal lesion in

this type of case, referred to the condition as "keratalgia." Many of my own patients had previously consulted several oculists, who had called the condition "neuralgia."

By far the best method of detecting the lesion is careful exploration of the cornea in a dark room with an ophthalmoscope, using a +4.00 lens. This was first demonstrated by von Szily.<sup>3</sup> By this means one can discover the smallest corneal lesion, sometimes only a faint shadow in the epithelium. As von Szily also pointed out, in some cases a faint shadow in the epithelium can be brought out, or accentuated, by holding the eye open for a moment to permit some drying to occur, and then again moistening the cornea. Having thus located the lesion it can usually be seen with the slitlamp. With this instrument one finds one or two to half a dozen small grayish-white spots in the epithelium, some of which may stain with fluorescein. By using the highest power in the Zeiss slitlamp it can be seen that some of these dots are superficial vacuoles. Vogt<sup>10</sup> reported seeing fine white dots in the epithelium, with the slitlamp, in the interval between attacks, and noted that in reflected light some of the dots appeared to be fine droplets. In some cases there is a slight unevenness of the surface, and definite localized epithelial edema. In others, where only the faintest shadow is visible with the ophthalmoscope, I have been unable to find the slightest disturbance with the slitlamp. Some disturbance of the corneal epithelium may be constantly present, even during the symptom-free period, or it may disappear entirely between attacks, only to recur again at a later time.

A few cases have been reported<sup>11,12,13,14</sup> of bilateral involvement without any known preceding trauma. The lesions were bilaterally symmetrical in the two eyes, and usually located just below the

center of the cornea. Most of these cases have been of the severe macroform. I have observed one case of this sort, which was less severe than the usual macroform, but slightly more severe than the usual microform.

Franceschetti<sup>15</sup> reported on six generations of a family 50 percent of whom were affected with recurrent erosion of the macroform. The tendency was transmitted as a dominant. Usually the trouble began with trauma, but not always. The first attack usually came at 4 to 6 years of age. The attacks became less frequent as the patients grew older, and did not occur after the age of 50.

#### FREQUENCY

The macroform is relatively rare. Most reports have been of from one to half a dozen cases, though Franke<sup>16</sup> reported 60. I find in my files a record of nine cases of the macroform. On the other hand, the microform is not uncommon, although often unrecognized. I have observed 28 cases of this form, the majority during the past few years.

#### PATHOLOGY

Haab<sup>17</sup> in 1890 was the first to point out that at the time of the recurrence the corneal epithelium was loosely attached and could be easily removed, sometimes from the entire cornea, save for a narrow rim around the periphery. Von Szily<sup>3</sup> confirmed this finding, and discovered that even between attacks, when the cornea was entirely healed and the patient symptom-free, a large portion of the epithelium was easily removable, for at least as long as five weeks. Franke<sup>16</sup> found the epithelium easily removable over a wide area in the mildest cases, as well as in the more severe. Peters<sup>18</sup> pointed out that this looseness of the epithelium must be considered as a mild form of edema, consisting of a thin layer

of fluid under the epithelium, which at the time of an attack increased, sometimes even to the formation of vesicles or bullae. Pathologic examination of the epithelium in such cases by von Szily<sup>3</sup> and Franke<sup>16</sup> showed edema of the cells, sometimes fluid spaces between them, often rupture of cells and extrusion of their contents. The same condition to a somewhat less degree was found by von Szily even when the epithelium was removed in the symptom-free period. Franke likewise found the same pathologic picture in epithelium removed in the mildest cases. Peters<sup>18</sup> first observed that in cases of corneal edema from other causes, such as herpes simplex, disciform keratitis and ulcer serpens, the epithelium was easily removable over a wide area, and this fact was also noted by Franke. This observation can be easily confirmed in any case of corneal edema. It seems clear, therefore, that some degree of epithelial edema is present in all stages of recurrent erosion, and is the principal feature of the disorder.

What is the cause of this edema? One of the most commonly accepted theories is that it is neuropathic in origin. Hansen,<sup>1</sup> the first writer on recurrent erosion, in terming the condition "intermittent neuralgic vesicular keratitis," evidently considered it to be a peripheral neuropathic process resulting from injury to the nerve endings of the cornea. Peters,<sup>18</sup> in a thoroughgoing discussion of the subject, spoke strongly for the neuropathic nature of the disease. He assumed that the persistent epithelial edema was due to nerve disorder. He explained the recurrent attacks on the basis of further injury to the corneal nerves, resulting in more edema of the epithelium, so that sudden opening of the lids could further loosen or tear it off. Verhoeff<sup>19</sup> in 1909, accepting the neuropathic theory, suggested that the original superficial trauma

to the cornea produced a condition of hyperexcitability in the Gasserian ganglion, and that the recurring corneal edema resulted from antidromic impulses passing backward from the ganglion along the sensory nerves. He felt that this explanation was not excluded in the nontraumatic cases, since it was conceivable that causes other than trauma could produce hyperexcitability of the ganglion. Salus<sup>12</sup> drew an analogy between the corneal edema of recurrent erosion and skin changes—blister formation, necrosis of the epithelium, and balloon degeneration, which can be produced experimentally by stimulation of vasomotor nerves. He cited Krubich, who in some cases was able to produce certain skin changes by local stimulation with such irritants as heat, cold, electricity. He thought these changes were due to indirect central stimulation of the vasomotor fibers in the cord by the sensory stimuli; that in the case of the eye, sensory stimulation, such as rubbing the eye in the nontraumatic cases, nerve injury in the traumatic cases, called forth this peculiar corneal response in the presence of an unstable vasomotor system. Other authors who accepted the neuropathic nature of the condition include Bronner,<sup>6</sup> Procksch,<sup>13</sup> Johelson,<sup>7</sup> von Schroeder,<sup>20</sup> Wicherkiewicz,<sup>21</sup> Bartels,<sup>22</sup> Hirsch,<sup>11</sup> Gifford,<sup>23</sup> and Franceschetti.<sup>15</sup> While the neuropathic theory is an attractive one, there is no real clinical nor experimental evidence in support of it. There can be no true analogy between vesiculation of the skin due to vasomotor influences, and corneal vesiculation, since in the former the changes are probably secondary to changes in capillary permeability, whereas in the latter case there are no blood vessels to be involved.

The recent experimental studies of Cogan and Kinsey<sup>24</sup> suggest an altered fluid exchange in the mechanism of edema

formation in the cornea, and may have some bearing on recurrent erosion of the cornea. Cogan<sup>25</sup> has shown that corneal edema and bullous keratitis may be produced by lowering the osmotic pressure of the fluid on the outside of the cornea. In the presence of a damaged endothelium and a hypertonic aqueous the epithelial edema occurred first and most extensively in the region overlying the damaged endothelium. According to this concept any defect in the endothelium would allow diffusion of electrolytes from the hypertonic aqueous into the stroma, thus increasing the osmotic tension of the corneal fluid in comparison with that of the tears, and causing edema.

In cases of persistent corneal edema after cataract extraction the evidence is very strong that a defective endothelium is the cause of the edema. In nearly all such cases careful examination will reveal either a primary endothelial dystrophy or an iris pillar, a piece of lens capsule, or a portion of the hyaloid membrane in contact with the back of the cornea in the region where the edema is first manifest.

For many years, I have had under observation a patient who is now about 82 years of age. Some years ago she developed glaucoma, for which an operation was performed. Later a cataract developed and an intracapsular extraction was done without complication. Her vision was good until she suffered a severe fall three or four years later, when her arm was fractured. While she was in the hospital being treated for the fracture the vision in the aphakic eye became very blurred. Examination showed considerable epithelial edema in the upper half of the cornea. Later a slitlamp examination was made, and it was found that vitreous was in contact with the back of the cornea in the upper part of the iris coloboma. Presumably the severe fall (which was

face forward) had ruptured the hyaloid and allowed vitreous to come in contact with the cornea. The corneal edema gradually became more marked, and bullae formed from time to time.

Recurrent vesicular or bullous keratitis has been reported after cataract or other intraocular operation,<sup>23,26,27,28</sup> in chronic uveitis,<sup>23,24,29</sup> in hereditary corneal dystrophy (Groenow),<sup>30</sup> and it is commonly observed in glaucoma. A defective endothelium in all these cases seems highly probable. In Fuchs's "epithelial dystrophy" in the earlier stages there is a "beaten silver appearance" of the back of the cornea, with no edema of the stroma or epithelium that is visible grossly. Later epithelial edema develops without obvious edema of the stroma, and it is only in the more advanced stage that frank edema of the stroma develops. Hence, even in cases where there is no apparent edema of the corneal stroma, a defective endothelium cannot be absolutely ruled out. After a corneal injury caused by an object striking it with some force, it is often possible to observe a cloudy zone on the posterior corneal surface directly behind the epithelial lesion. This clouding completely disappears in a few hours, but one cannot be sure when the endothelium has entirely returned to normal. Traumatic recurrent erosion commonly follows a type of injury where there is a sudden sharp forceful contusion which might conceivably damage a particularly susceptible endothelium. One of my patients suffered a slight injury to the cornea of her left eye when a twig struck it, and developed recurrent erosion of the microform. Two years later the other eye was struck by the corner of a piece of paper, and she developed recurrent erosion in this eye also. It would appear that her corneas were particularly susceptible to this type of trouble. A defective endothelium,

either as the result of direct trauma or other cause, as has been suggested by Cogan,<sup>25</sup> must therefore be considered in the persistent epithelial edema of recurrent erosion. Whether or not this concept is correct must await further clinical and experimental evidence.

Why do the attacks come only during the night or on first opening the eyes in the morning? There can be no doubt that the suction between lid and cornea can result in further loosening or tearing-off loose epithelium when the lids are suddenly opened. Patients often volunteer the observation that when they are suddenly awakened out of a sound sleep and open the eyes quickly, an attack is very likely to be brought on, whereas if the eyes are opened slowly and carefully there may be no trouble. Von Szily<sup>3</sup> maintained that in the case of attacks coming in the middle of the night the patient always first awakened and opened the eyes, and then the attack commenced. That this is sometimes the case cannot be denied, but it is equally certain that some patients are awakened out of a sound sleep by pain in the eye before any attempt is made to open the eyes. De Schweinitz<sup>31</sup> reported a case in which on several consecutive nights the patient was awakened out of a sound sleep by severe pain in the eye, and examination on each occasion revealed the presence of a large corneal bulla. As pointed out by Cogan<sup>25</sup> corneal edema from any cause is worse after sleep, presumably owing to the lessened osmotic tension of the tears overlying the cornea, when there is no surface evaporation. Patients with corneal edema frequently volunteer that their vision is worse after weeping, and this is again probably due to lowered osmotic tension of the tears in contact with the cornea. One of my patients, suffering from recurrent erosion of the microform, following a minor injury, stated that an

attack was invariably precipitated by weeping. Another patient had two attacks during the day, each time immediately after bathing in a fresh-water pool. Curdy<sup>32</sup> reported a case of recurrent erosion of the cornea which was relieved by opening a stricture of the lacrimal duct. Any corneal edema can be made worse by bathing the eye with a hypotonic solution. Indeed, epithelial edema can be readily induced in any normal eye by a bath of hypotonic solution.<sup>33</sup>

In recurrent erosion the attacks come only in the middle of the night, or on awakening in the morning, presumably due, at least in part, to an increase in the corneal edema caused by lowered osmotic tension of the tears. The prevention or amelioration of attacks by putting a bland ointment in the eye at bedtime has been reported in the literature,<sup>8,9,34,35</sup> and I have found it extremely efficacious. Here the oily film on the surface of the cornea presumably prevents the imbibition of tears.

To explain the periodicity of the attacks, one could assume a temporary change in the osmotic balance between the corneal fluid and the tears. There is no doubt, however, that the manner in which the eyes are opened after sleep may determine whether or not an attack occurs. More difficult to explain is the efficacy of the generally accepted treatment of the macroform, consisting in removal of all loose epithelium, scraping of the cornea, and cauterization of the denuded area with a chemical agent, the fact that recurrent erosion practically never occurs in cases where there has been infection and scar formation, and that, during a recurrence, if there is infection and scar formation, no further attacks occur. In these cases there is more or less destruction of Bowman's membrane, and it has been assumed that the new epithelium then adheres so tightly to

the underlying stroma that fluid cannot collect beneath it.

### TREATMENT

There is no doubt that in some cases the attacks sooner or later cease to occur, without treatment. Since it is impossible to predict which patients will continue to have recurrences, it is best to employ radical treatment only in cases in which there have been many severe attacks at relatively short intervals.

The favorable effect of putting a mild ointment in the eye at night has already been cited.

Three cases have been reportedly cured by the use of 5-percent Scharlach R ointment and a pressure bandage, followed by the use of 3-percent boric ointment in the eye every night for three months.<sup>35</sup>

A bland ointment plus massage of the eye has also been recommended,<sup>36,37</sup> as well as the use of a pressure bandage for several days after an attack.<sup>38</sup>

X-ray therapy has also been advocated.<sup>27,30</sup> Beneficial effect has been reported with quinine,<sup>11,23</sup> and by the use of vermifuges.<sup>14</sup>

From a study of the literature one cannot fail to be impressed by the efficacy of treatment consisting in removal of all loose epithelium, scraping the cornea, and cauterization with a chemical agent.<sup>3,9,12,16,23,29,36,40,41,42,43</sup> Franke<sup>16</sup> reported 60 cases treated in this manner, using chlorine water as the cauterizing agent, with cures in all but two. In addition to chlorine water,<sup>9,12,16</sup> trichloroacetic acid<sup>23</sup> and iodine<sup>29</sup> have been used for chemical cauterization.

Two of my patients suffering from the macroform have been relieved (one was treated 8 years ago, the other 3 years ago) by removing all loose epithelium, lightly scraping the cornea, and applying 10-percent trichloroacetic acid. In one a very faint corneal haze resulted, which

did not interfere with vision. In the other there was no opacity. In the microform, I should like to emphasize the dramatic relief obtained by putting 10-percent boric ointment in the eye at bedtime, and cautioning the patient about using care when first opening the eyes after sleep. After using the ointment every night for a period of a few weeks some patients are apparently permanently relieved. In others, after a period of one or several months without treatment, the attacks may commence again, but it is a great satisfaction to the patient to feel that he has at hand a simple remedy which, if it does not always permanently cure the disorder, will at least eliminate the symptoms while it is being used. Whether or not the nightly use of boric ointment will prevent attacks in the macroform I have not determined. In this form the attacks as a rule come months or years apart, and few patients will consent to putting ointment in the eyes for such a long period when they are without symptoms.

#### SUMMARY AND CONCLUSIONS

1. From a clinical standpoint, two forms of recurrent erosion can be recognized, the macro- and the microform. In the macroform the corneal lesion is relatively large, the symptoms are prolonged and severe, and attacks occur as a rule

at long intervals. In the microform the lesion is small, usually 1 to 2 mm. in diameter, the symptoms are mild and of short duration, and the attacks come at frequent intervals.

2. The microform is apparently three or four times as common as the macroform.

3. Careful exploration of the cornea in a dark room with the ophthalmoscope, using a +4.00 lens, is a practical method of detecting the corneal lesion in the microform.

4. A damaged endothelium may be the cause of the persistent epithelial edema.

5. The occurrence of the attacks at night or on first waking from sleep may be due not only to the trauma incident to opening the eyes, but also to increased epithelial edema at this time from a relative hypotonicity of the tears overlying the cornea.

6. For treatment of the microform it is recommended that an ointment (10-percent boric) be put in the eye at night, and that the patient be instructed to use care in opening the eyes after sleep. For the macroform apparently the most effective treatment is removal of all loose epithelium, scraping the cornea, and chemical cauterization of the denuded area.

5 Bay State Road. (15).

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## ELECTRICAL SENSITIVITY OF THE EYE IN SOME OPTIC-NERVE DISEASES RESULTING FROM CRANIO-CEREBRAL TRAUMATA\*

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Penetrating wounds of the brain frequently cause intracranial infection and involve changes in the ophthalmoscopic picture of the fundus; namely, papilledema. The nature of the edema is varied. Sometimes it is caused by a stasis of the fluid of the optic nerve (choked disc) and in some instances it is the result of an inflammatory process in the nerve (neuritis).

According to ophthalmologists it is often difficult to decide, on the basis of the ophthalmoscopic picture only, whether the papilledema is the result of an in-

flammatory or of a noninflammatory process. Blurred disc margins, hyperemia (congestion), bulging of the disc, disproportion in the diameter of veins and arteries do not seem definite enough to allow of a proper initial differential diagnosis. Axenfeld,<sup>1</sup> for example, has stated: "If the inflammatory focus in the optic nerve is situated somewhat posteriorly to the disc, the latter is simply involved in the process owing to collateral edema. To differentiate a choked or an inflammatory disc is quite embarrassing in this case." The degree of elevation of the swollen tissue is no reliable criterion because of the absence of more or less considerable edema in the early stages of genuine choked disc, and further: "If no functional disturbances are present, optic-nerve inflammation in its early stages is apt to remain undetected." A well-established differential diagnosis, on the other hand, is of great value in indicating proper treatment.

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Because of transportation difficulties it has been impossible to get a corrected proof from the authors.

## EXPERIMENTAL

In order to help in solving this difficult problem we attempted a method of differential diagnosis between choked disc and optic neurosis, based on the determination of the electrical sensitivity of the eye. It seems probable that the electrical sensitivity of the eye may reflect the deep-seated retrobulbar changes of

rent giving rise to a phosphene, the patient had his head covered with an opaque black cloth. The determination was first performed on eyes adapted to light and later on eyes adapted to darkness after the patient had been sitting for 6 to 7 minutes with his head covered with a black cloth and his eyes closed; then once again on the light-adapted eyes

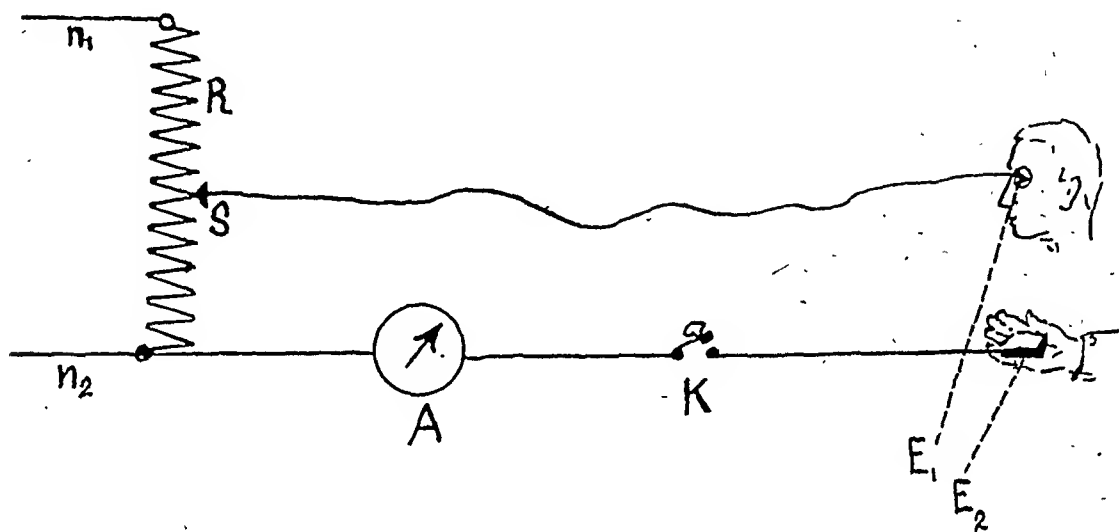


Fig. 1 (Kravkov and Mursin). Scheme of the arrangement for measuring electrical sensitivity of the eye.

the visual apparatus. This investigation was carried out in 1941-1942 in two base hospitals in Kazan.

*Method.* A routine apparatus was used to determine the threshold current giving rise to an electrical phosphene (rheobase). The scheme is represented in figure 1, in which  $n_1$ ,  $n_2$  are the wires attached to the source of the current;  $R$ , the resistor, is switched on as a potentiometer;  $E_1$ ,  $E_2$  are silver electrodes placed on the hand and on the eye of the patient;  $S$  is a slide running through the wire of the resistor,  $R$ ;  $A$  is a microammeter;  $K$  is a key for switching on and disconnecting the circuit.

The test was performed in a lighted room, usually in the morning. During the determination of the threshold cur-

after these had been open for 5 to 7 minutes in a lighted room. Thus, the method enabled us to determine the level of the electrical sensitivity of the patient's eye as well as its adaptation changes as these occurred during the transition from light to darkness and inversely. Unfortunately, we were unable to standardize the brightness of the light used for adaptation; however, there have been no significant differences in the level of this brightness.

The data obtained in our experiments are presented graphically. Periods of light and dark adaptation of equal duration (see figs. 2 to 5) are marked on the abscissa; values of the threshold current measured in  $10^{-5}$  A (ampères) are marked on the ordinate,  $L$  being the

TABLE 1  
NATURE OF INJURY AND FUNDUS CONDITION

Patient	Region of the Wound	Fundus	Visual Acuity		Ratio D/L	
			O.D.	O.S.	O.D.	O.S.
1	Frontal	O.D., neuritic changes O.S. no pathologic conditions	0.2	0.5	1.00	1.00
2	Left temporal	O.D. remainders of a choked disc O.S. hyperemic disc, retinal detachment	0.5	0.8	1.20	1.22
3	Occipital	Hyperemic disc and edema in both eyes	0.5	0.1	1.46	1.46
4	Left temporal	Normal	0.8	0.5	1.60	1.41
5	Fronto-parietal	Normal	0.01	1.0	1.14	1.46
6	Parietal	Normal	0.9	0.6	1.88	1.33
7	Occipital	O.D. blurred disc margins	0.2	0.1	1.23	1.20
8	Occipital	Normal	—	—	—	1.11
9	Left parieto-temporal	O.D. normal O.S., papilledema	0.4	0.3	1.30	1.46
10	Occipital	Normal	—	—	—	1.46
11	Fronto-parietal	Hyperemic disc, blurred margins, neuritis	1.0	1.0	1.02	0.96
12	Right temporal	Neuritic edema	0.1	0.2	0.96	1.03
13	Parieto-occipital	Bilateral postneuritic optic atrophy	0	0.2	0.94	1.18
14	Occipital	Hyperemic and choked disc of neuritic type	0.01	0.2	1.36	1.09
15	Left fronto-temporal	Neuritic papilledema	0.6	0.1	1.08	1.03
16	Parieto-occipital	Slightly choked disc in both eyes	0.3	1.0	1.75	1.56
17	Fronto-parietal	Choked disc in both eyes	0.9	0.8	1.20	1.54
18	Left temporal	Choked disc; small hemorrhages	—	—	1.72	1.64
19	Parieto-occipital	Papilledema	1.0	—	1.37	—
20	Occipital	Normal	1.0	1.0	1.36	1.52
21	Fronto-parietal	O.D., hyperemic disc O.S., choked disc	1.0	1.0	1.02	1.18
22	Occipital	Normal	—	—	1.21	1.04
23	Occipital	Blurred disc margins; slightly hyperemic disc	—	—	1.53	1.32
24	Right temporal	O.D., slight temporal pallor O.S., normal	—	—	1.20	1.79
25	Occipital	Normal	—	—	1.42	1.18
26	Head contusion	Hyperemia, edema, and hemorrhages in both discs	—	—	1.80	1.62
27	Fronto-occipital	Choked discs and hemorrhages	0.3	0.1	1.36	1.38
28	Fronto-parietal	O.D., hyperemic disc, edema	0.7	1.0	1.17	1.23
29	Frontal	O.D., slight pallor of the disc O.S., optic atrophy	0.3	0	1.06	1.06
30	Occipital	Normal	0.2	1.0	1.42	1.48
31	Occipital	O.D., normal O.S., hyperemia, indistinct margins of the disc	0.9	1.0	1.57	1.27
32	Parieto-temporal	Edema, indistinct margins and pallor of the disc; postneuritic atrophy	0.2	0.15	0.94	0.90
33	Parieto-temporal	Choked disc, slight edema, slight protruding, hemorrhages	0.1	0.1	1.62	1.60
34	Parieto-occipital	Choked discs	0.3	0.4	1.40	1.30
35	Temporal	O.S., optic atrophy O.D., normal	0.3	0.01	1.80	1.09

period of light and D that of dark adaptation.

Our observations cover 35 cases of cranio-cerebral traumata. In many instances electrical sensitivity of a patient's

eye was measured twice, thrice, and even oftener, these measurements having been repeatedly carried out over a period of some months. In addition, the electrical sensitivity of a control group of six

healthy persons with a normal organ of sight was investigated under the same conditions as obtained in the test. Three patients who had undergone an enucleation of the eye for a traumatic iridocyclitis have also been tested. We were anxious to find out in what proportions the adaptation changes were preserved in the stump of the enucleated eye.

The ophthalmoscopic diagnosis was

had been ophthalmoscopically made, the threshold of electrical sensitivity was found to be between  $18 \cdot 10^{-5} \text{A}$  and  $60 \cdot 10^{-5} \text{A}$ . In cases wherein disc congestions and other changes of a neuritic nature in the fundus were present we observed, as a rule, a still more significant decrease in electrical sensitivity. In five such patients the threshold value varied from  $22 \cdot 10^{-5} \text{A}$  to  $160 \cdot 10^{-5} \text{A}$ . It is to be

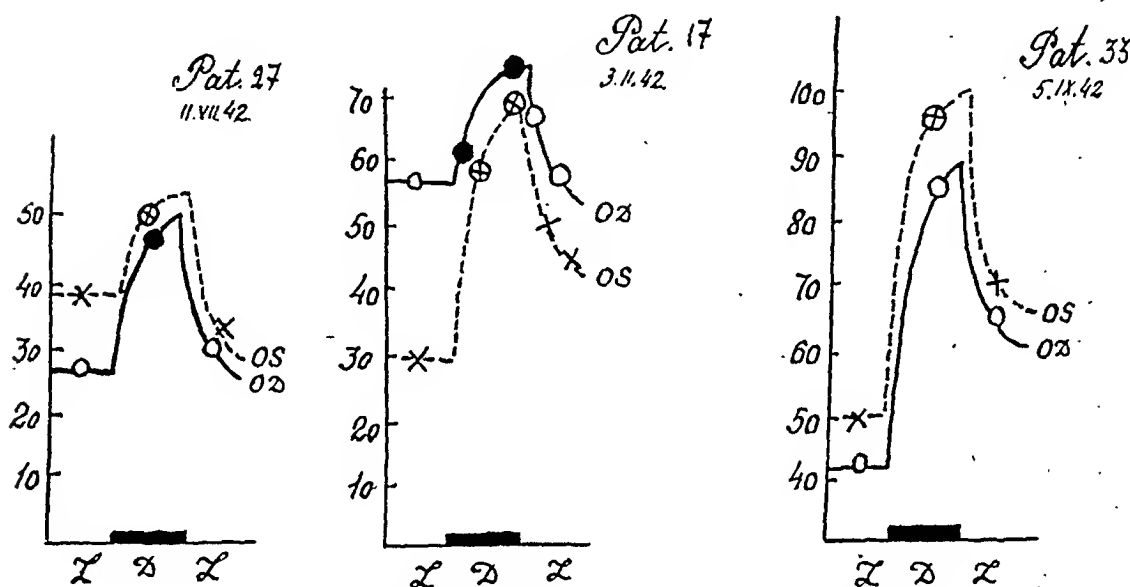


Fig. 2 (Kravkov and Mursin). Adaptation changes of the threshold current in the cases of choked disc.

established by one of us (A. N. M.). Table 1 contains brief data on the nature of the injury we had to deal with and on the ophthalmoscopic fundus condition. These data are shown in columns 2 and 3.

**Results.** The results of all the tests performed allow the following conclusions to be drawn:

1. Electrical sensitivity of the eye is decreased in the case of a choked disc as well as in neuritic changes in the fundus.

Thus the threshold of electrical sensitivity in patients with a normal organ of sight (having never undergone this kind of test) varied under light conditions between  $8 \cdot 10^{-5} \text{A}$  and  $18 \cdot 10^{-5} \text{A}$ . In six patients whose diagnosis of choked disc

noted that we had the opportunity to observe certain cases wherein a diagnosis of choked disc and neuritic hyperemia had been made; nevertheless the threshold value of the current remained almost as high as in the controls (inexperienced in this kind of test). It may very well be that in these cases the level of electrical sensitivity of the patient's eyes was still decreased, the threshold value being higher than under normal conditions in the same individuals.

2. In cases of papilledema of non-inflammatory nature the normal picture of adaptation changes of the electrical sensitivity of the eye is preserved; that is, under dark conditions the threshold value

increases, and, inversely, under light conditions it falls—that is, the sensitivity rises (fig. 2).

3. Abnormal adaptation changes in electrical sensitivity of the eye are char-

curred in all cases suggestive of optic neuritis.

Thus, the data obtained lend some support to the statement that the measurement of adaptation changes of the

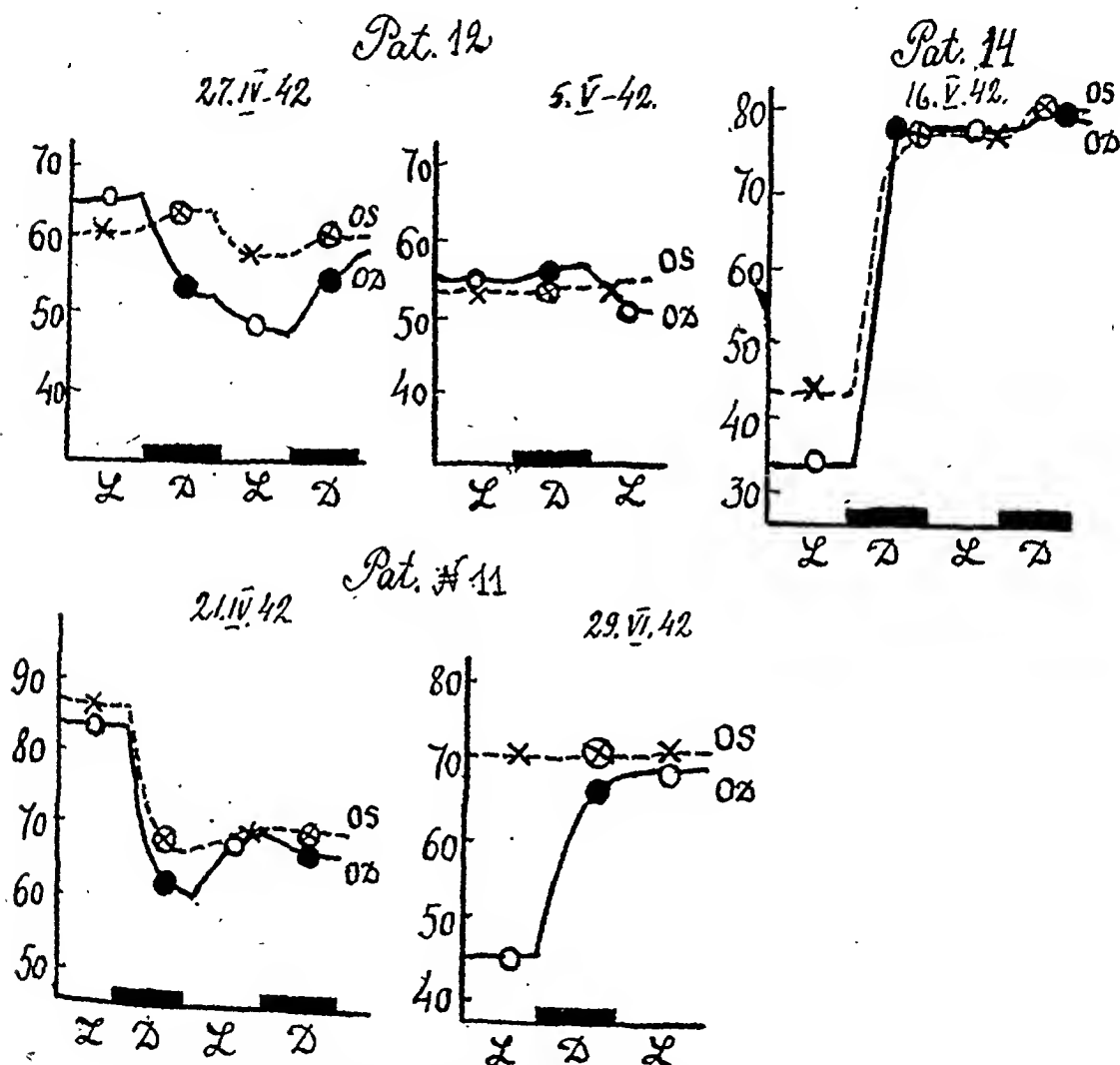


Fig. 3 (Kravkov and Mursin). Adaptation changes of the threshold current in the cases of optic neuritis.

acteristic of patients presenting neuritic alterations in the optic nerve, and of those whose case history is suggestive of such alterations. Electrical sensitivity remains almost unchanged or shows abnormal changes in these cases under transition from light to darkness and inversely.

Figure 3 shows some typical pictures of such adaptation disturbances. They oc-

cur in all cases suggestive of optic neuritis. Thus, the data obtained lend some support to the statement that the measurement of adaptation changes of the electrical sensitivity of the eye is a rather helpful method for establishing a differential diagnosis between inflammatory and noninflammatory papilledema. The adaptation changes in the electrical sensitivity of the eye may be presented quantitatively by the ratio  $D/L$  where  $D$  is the threshold intensity of the current, under dark adaptation and  $L$  the threshold intensity

of the current under light adaptation.

The ratio  $D/L$  has been calculated in all the cases we investigated. The values are shown in column 5 of table 1.

It will be seen that in the presence of neuritic changes in the optic nerve the ratio  $D/L$  is comparatively small and frequently approaches 1. It is to be noted here that the average value of  $D/L$ , calculated from the results yielded by all our experiments in normal cases under

changes under dark and light conditions of the other eye, even if the electrode is applied to the stump of an enucleated eye confirms this assumption. The adaptation changes in the electrical sensitivity of the stump of an enucleated eye has been previously described by Akimotchkina, Bogoslovski, and Ivanova.<sup>2</sup> Their finding was corroborated by us in connection with the present paper (see our data on figure 4).

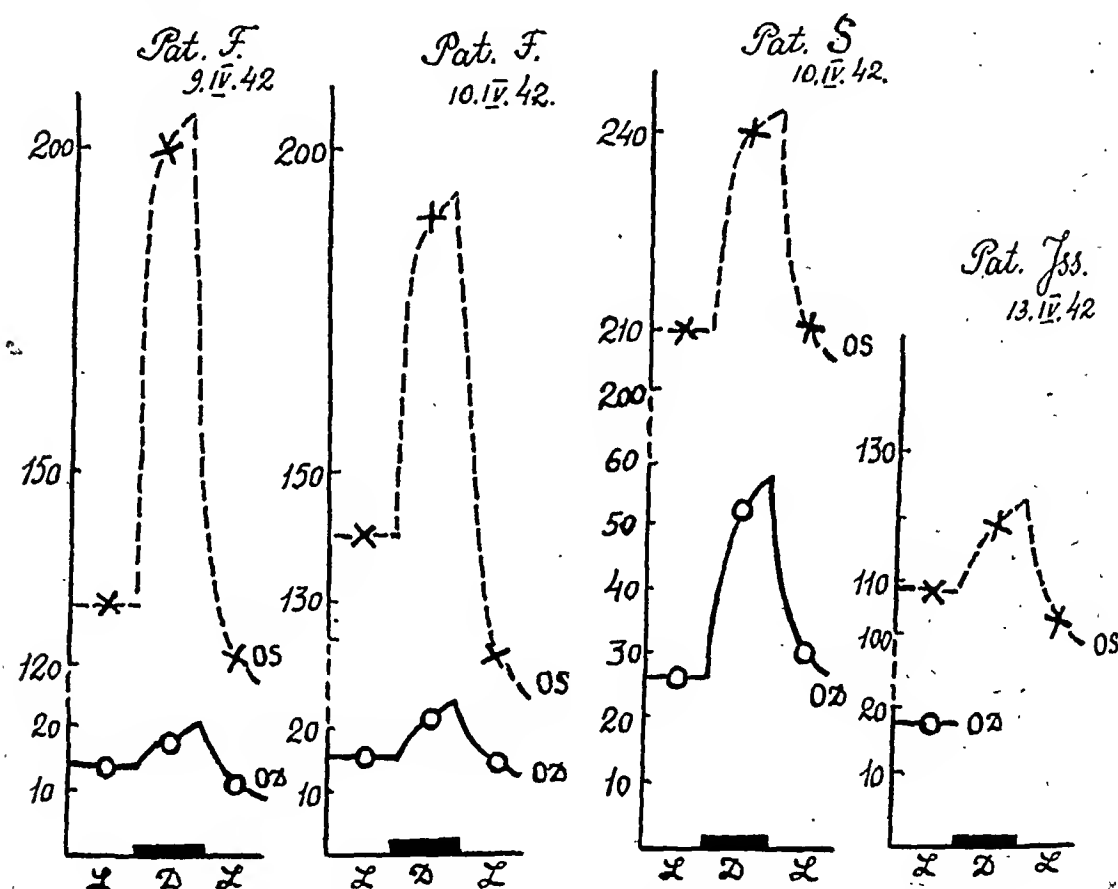


Fig. 4 (Kravkov and Mursin). Adaptation changes of the threshold current in the stump of an enucleated eye.

the same test conditions, has been 1.87—thus, greater than in all the cases of cerebrocranial injuries we investigated.

4. Disturbances of the adaptation in the electrical sensitivity of the eye may rather denote retrobulbar processes taking place in regions situated more centrally from the eyeball.

The maintenance of normal adaptation

The threshold values of the current for the stump of an enucleated eye are marked in figure 4 by a broken line; those for the normal (control) eye, by a solid line.

5 The determination of the electrical sensitivity of the eye is a rather helpful method for the clinician, frequently revealing abnormalities in cases wherein

the ophthalmoscopic picture of the fundus seems to be normal.

Thus, for example, in one case (patient 24), the changes in electrical sensitivity of the eye prognosticated atrophic changes in the disc. In another case (patient 6), where there had been a wound in the right parietal region and a left-sided hemiplegia, we were able to detect a considerable decrease of the electrical sensitivity of the left eye, although the

later, the electrical sensitivity of the eye became decreased again, although the ophthalmoscopic picture remained normal. A month later the condition of the patient became worse.

In some cases we have found a somewhat close correspondence between the picture seen ophthalmoscopically and the data obtained by the measurements of the electrical sensitivity of the eye (see, for example, figure 5).

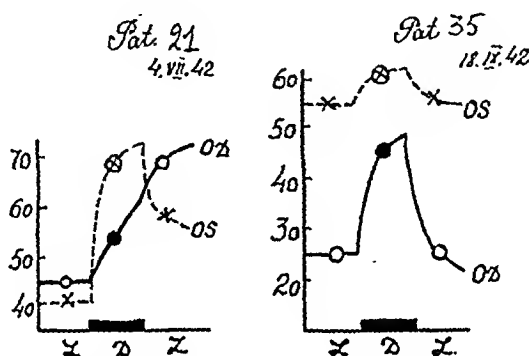


Fig. 5 (Kravkov and Mursin). Abnormal adaptation changes of the threshold current paralleling the anomalies seen ophthalmoscopically.

ophthalmoscopic picture of this eye proved to be normal. In patient 14, wounded in the occipital region by a shell fragment, ophthalmoscopy at first showed no abnormality in the fundus. Meanwhile, the electrical sensitivity of the eye had decreased and its adaptation changes disturbed. A brain abscess was soon diagnosed and drained. (The fundus now shows a choked disc of the neuritic type.) The determination of electrical sensitivity of the eye, made after the patient had recovered, showed considerable improvement, though the electrical sensitivity had not reached its normal level. Some days

Patient 21 showed a noticeable disturbance of the adaptation in the electrical sensitivity of his right eye. The electrical sensitivity of the left eye of patient 35 was considerably worse than that of his right eye. Correspondingly, ophthalmoscopy disclosed in the case of patient 21 a normal condition in the left eye and a hyperemic disc in the right eye; in patient 35 ophthalmoscopy revealed a descending optic-nerve atrophy in the left eye and a normal fundus in the other.

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# IMPROVED TREATMENT FOR CHEMICAL BURNS OF THE EYE

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There are few injuries of the eye more serious, and before which the physician is more helpless, than are severe chemical burns. Such accidents moreover, are not so rare as they should be, in industry or elsewhere.

For the relief of these cases, published thought seems to occupy itself with: (1) copious irrigation with water;<sup>1, 2, 3, 4, 5, 6, 7</sup> (2) neutralization of reagents causing injury;<sup>2, 3, 5, 6, 8</sup> and (3) prevention or correction of scarring from the burns of lids, conjunctiva, and globe. The writer discovered only two instances of therapeutic intervention leading beyond these methods. Value of such basic principles is in no way to be discounted, but they do frequently fall short of meeting needs of a specific problem. Any modification or addition which will increase the average of good results in these emergencies seems worthy of publication.

Neuman<sup>9</sup> dealt with immediate transplantation of mucous-membrane grafts to cover necrosed areas of conjunctiva, and was quite convinced of its great value, both as to speed of recovery and as to improvement of end results. With this the writer has had no considerable experience.

Pichler<sup>10</sup> and Middleton<sup>2</sup> brought out the great helpfulness of corneal paracentesis in saving eyes burned by ammonia. Application of this procedure to other ocular burns of serious degree, with encouraging results, appeared to justify some testimony as to its usefulness.

In their writings, the aforementioned writers maintain that this is the only way to prevent loss of an eye damaged by ammonia. They state that the method

helps by liberating aqueous which is loaded with ammonia that has permeated corneal tissues, thus freeing the iris from destructive effects of the poison upon it. Walter Kies<sup>11</sup> has described well the changes that take place in ocular tissues from action of ammonia upon the globe. His description bears out the belief of others that this alkali does rapidly find its way into the aqueous.

Since this is true of ammonia, it appears not unlikely that other powerful chemicals may act upon the eye in a similar fashion. The present writer was particularly impressed that this might be true of most alkalis. Brief case narrations may serve best to illustrate results achieved by paracentesis and repeated drainage in cases of several types.

## CASE REPORTS

On December 27, 1937, a boy, aged 16 years, was brought in because of burns about the face and eyes from the explosion of a carbide tank near which he was working. Force of the explosion rendered him unconscious momentarily. Conjunctiva and lids of the left eye were burned, and the cornea was densely white, except for a margin about 2 mm. wide, at the limbus above. Copious irrigation with water had already been carried out.

The anterior chamber was opened at once with a keratome. Escaping aqueous was opalescent and appeared to be under abnormal pressure. For one week, daily drainage was done by depressing one lip of the wound with a spatula. Aqueous fluid was macroscopically transparent after the second opening.

By January 5th, this cornea had cleared

sufficiently to permit visualization of the iris, and of a traumatic cataract which appeared to have resulted from the force of the explosion. Corneal clearing progressed until, at the end of four months, only slight general haziness remained. Had I at that time been familiar with the use of ammonium chloride or tartrate in this connection, the remaining haziness might have been erased, for it was learned that lime made up one of the chief ingredients of this particular carbide mixture.

On April 5, 1941, a child, aged 2 years, was hurried from a town 90 miles away, because of lye burns of the face and eyes. His family physician had irrigated the injured eye freely with water about one hour after the accident.

The child's face was covered with corrosive burns of varying degree and extent. His lower lip was greatly swollen, and much of its mucosa gone. The caustic solution had more or less saturated his clothing over the left deltoid area, and a large patch of skin there was entirely destroyed. His right eye had escaped, but the left showed whitened conjunctiva of lids and globe, and a cornea that was "milk white" and opaque, except for a narrow crescent adjacent to the superior limbus.

Paracentesis of the cornea was speedily accomplished, and hospitalization begun. Eight hours later, the wound was reopened with a spatula, thereby again liberating a quantity of opalescent aqueous. In another 13 hours the drainage was repeated, and the eye looked appreciably better. Twice each day the wound was reopened for three days. Then intraocular pressure remained normal to palpation, and the drainage was carried out only once a day for another four days, at the end of which time it was discontinued.

The upper two thirds of the cornea became rapidly transparent to macroscopic observation, and the iris had a normal appearance.

Three months later, there was a leucoma occupying a lower section of the cornea, extending from the 5- to the 7-o'clock position at the limbus and to a little above the center. The iris still appeared normal, and there was no evidence of degenerative changes in the globe, except for the leucoma, and the intraocular pressure, which was 26 mm. (Schiøtz). So far as the writer knows, this patient still retains his eye and has had no further trouble with it. At that time he was too young to give me a satisfactory idea of his vision, or of the visual field remaining. Results in this case, considering that several hours had elapsed before he reached me, and in view of the severity of the burns, were striking. Certainly, from all therapy usually advocated for these cases one had no right to expect anything more than an atrophic stump.

Sometime after the experience with this second case, there came under observation, a young man whose wife instilled beechwood creosote into his left eye, thinking she was using a collyrium he had requested. When first seen, this patient was in great pain, and there was obvious destructive action of mild extent upon the conjunctiva of the lower eyelid. The cornea presented no visible haziness, although there was some loss of surface tissue. The usual treatment for such burns was instituted but gave little relief. In 48 hours pain actually seemed more severe, intraocular pressure was definitely increased, and there was evidence of uveitis. Corneal paracentesis was performed. Following the immediate period of acute agony from this operation, this man slept for the first time since his injury.

Daily drainage was carried out for four days. The eye rapidly recovered, and no visible damage remained from the accident; visual acuity was 20/14.

These several cases may serve to emphasize the fact that something more effective may be done for chemical burns of the eye, whether they be mild or of serious degree. Naturally, the outlook in any severe case is infinitely better if the procedure can be carried out in the first hour or two after injury. However, the method still seems to promise much help, even after this lapse of time, and especially in regard to relief of pain and tension.

The high favor in which S. R. Gifford and his father before him held corneal section for the relief of advancing ulcers may not be entirely without significance in this particular. Perhaps other helpful effects are achieved, besides liberation of chemical toxins which have become mixed with aqueous, and freeing uveal tissues of their destructive action. Relief of pressure upon the greatly swollen corneal tissues must surely promote better circulation of fluid through their lymph spaces, to lessen necrosing influences. The surprising relief obtained from agonizing pain, in most of these patients, is itself sufficient evidence of alleviation.

The most impressive tissue changes are seen in the cases of burns due to lime and to lye, in which the cornea is almost immediately white from the effect of the caustic. Here, it should be emphasized, drainage must be instituted just as soon as possible. Every minute of delay represents lost chances of recovery. In these severe injuries, drainage twice daily should be kept up for several days, then once each day for three to five days longer.

The method of performing the paracentesis with a bevelled plane has been clearly described by many others and need not be repeated here. Successive openings are readily accomplished with a thin surgical eye spatula, and repeated incision is rarely necessary, unless a longer period than 24 hours elapses between treatments. Aqueous is allowed to escape slowly until the anterior chamber's apparent depth is diminished by one half to two thirds.

Most writers are specific in differentiating, as to therapy, between burns from acids and those from strong alkalis. Perhaps the method of attack upon tissues of the globe does differ chemically with each, but there is no proof as yet that the same harmful influences are not set in motion by both of these agents of tissue destruction. Response to surgical treatment suggests that the same underlying principles may be operative through all such agents of injury. Similar favorable experience with a severe gasoline burn of conjunctiva and cornea, coming after a series of experiences such as those aforescribed, has led the writer to believe that paracentesis of the cornea should be established as a standard procedure for every moderate or severe burn of the cornea where any tissue destruction or haziness results, irrespective of the chemical involved.

Such a broad statement might properly lead one to inquire concerning the use of this method in the treatment of war-gas injuries of the eyes. Many characteristic pathologic results therefrom suggest chemical burns in slow motion, as it were. Certainly few of us have had any opportunity to observe these lesions in private practice, but this problem should readily lend itself to study through animal experimentation.

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## VISUAL SYMPTOMS CAUSED BY DIGITALIS\*

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The purpose of this paper is to report the visual symptoms that occurred in six patients who were taking digitalis. In three, general symptoms of digitalis intoxication caused the patients to return to the internist for advice but the other three came directly to me because of visual disturbances. None of these suspected digitalis as the cause and none gave me a history of taking digitalis until they were specifically questioned regarding it. These three showed no other signs nor symptoms of digitalis intoxication except for the visual complaints and so it was natural for them to consult an ophthalmologist rather than the physician who had described the cardiac drug.

That digitalis may cause visual disturbances has been known for at least 159 years. In 1785 William Withering<sup>1</sup> in his

classical paper on the foxglove stated that when given in large doses, it might result in "confused vision, objects appearing green or yellow. Although the general literature contains numerous references<sup>2</sup> to this subject, very little concerning this condition could be found in the American ophthalmological literature.<sup>3</sup> Paul D. White, the prominent Boston cardiologist, recently stated<sup>4</sup> that he sees "several such patients a year who had just enough oversaturation with digitalis to have developed these eye symptoms," but he feels "quite sure that the average doctor does not inquire about them." In speaking with internists I received the impression that the condition is not well known to them and I think it is even less well known to ophthalmologists.

The general symptoms are usually much more prominent than the visual disturbances. The most common<sup>2,5</sup> are anorexia, nausea and vomiting, and occasionally diarrhea. These symptoms are not due to any effect on the gastrointestinal tract but are central in origin—just as the

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eye symptoms are probably central in origin. There may be marked slowing of the heart rate and the electrocardiogram may show a characteristic graph. The central nervous system infrequently reacts by depression or excitement, headache, impairment of memory, confusion, or delirium.<sup>6</sup>

The visual symptoms of the patients seen by me were as follows (table 1): Two stated that snow seemed to cover everything at which they looked. My face

The white vision of which two of these patients complained is mentioned in the literature. One man,<sup>7</sup> on looking from his hospital window, saw white automobiles travelling along the street. His daughter, dressed in a dark-blue coat, came to visit him, and he asked her when she had obtained her white coat. He then thanked her for the white flowers she had brought him—they were actually red tulips. The colored vision may also be green, blue, yellow, or red. Flickering and flashing

TABLE 1  
DATA ON VISUAL DISTURBANCE FROM DIGITALIS

Name	Sex	Age	Dose—Powdered-Leaf Tablet Form	Symptoms	Vision	Eye Pathology
U. N.	F	42	Maintenance dose 0.1 gm. daily	Snow on everything	20/20 O.U.	None
J. L.	M	43	0.3 gm. daily—3 gm. in 10 days	White and yellow snow	20/20 O.U.	None
J. B.	F	75	Maintenance dose 0.1 gm. daily	Bright shiny spots, sees "diamonds"	20/100 3/200	Diabetic retinopathy, lens opacities
J. F.	F	85	0.2 gm. daily for 30 days followed by 0.3 gm. for 2 days	"Nearly blind," flashing lights, nausea	20/70 O.U.	Lens and vitreous opacities
D. K.	M	33	4.4 gm. in 10 days (Pt. weighed 275 lbs.)	Red and green spots, nausea	20/20 O.U.	None
H. M.	F	41	0.4 gm. daily for 7-9 days	"Black lines," "glare," green vision, nausea, vomiting	20/20 O.U.	None

seemed to have snow on it. One colored man said my face appeared covered with "sulphur" or "yellow snow." When he closed his lids he saw yellow flowers dangling in front of his eyes. One woman saw bright shiny objects which looked like gold fish and complained of lights flickering. Another saw bright and dark spots. A physician who before taking digitalis noticed black specks floating before his eyes complained that these specks had turned to red and green spots. He said that he had always had *muscae volitantes* but they became colored after taking large doses of digitalis. The sixth patient said everything was green. She stayed in a dark room because of the "glary brightness."

of light are said to be early symptoms.<sup>2</sup> Purkinje<sup>8</sup> in 1825 experimented on himself, and noticed light flashes, flickering, and flowerlike figures in the center of his visual field.

This condition frequently recurs. One of the aforementioned patients had a previous attack of green vision associated with nausea and vomiting. She judged her recovery by looking at the apparent color of her skin. After the drug was stopped for a few days she said that at times her skin appeared normal in color, at other times it still seemed green. Jackson<sup>9</sup> reported a case of yellow vision which cleared up spontaneously in five weeks, reappeared a year later for eight weeks, and upon recurrence in a third attack was

accompanied by such general disturbances that hospitalization was sought and the true nature of the visual disturbances finally discovered.

The visual acuity, fields, and fundi of the patients seen by me were unaffected by the digitalis when I examined them. Despite all the symptoms mentioned there was nothing to be found objectively. One patient stated that during a previous attack she had lost the sight in one eye and had been unable to read with that eye. Jackson<sup>9</sup> wrote that his patient was unable to read the largest type in the newspaper but nine days after discontinuing the drug "she could read the finest print." He states that at times she had double vision and often the right side of an object disappeared before her eyes. Smith<sup>6</sup> mentioned blurring of vision, scotoma, diplopia, and colored vision. One report<sup>2</sup> by a cardiologist describes a patient receiving digitalis in normal doses who developed "almost complete blindness"—ophthalmologists could find nothing wrong—finally the possibility of digitalis amblyopia was considered, the drug was stopped and the sight returned completely. Another article<sup>10</sup> mentions a temporary complete blindness as well as an amaurosis which lasted three days.

How are we to interpret these reports? The most likely interpretation to me seems to be this: Digitalis acts on the central nervous system, it stimulates centers in the medulla which cause nausea and vomiting, it probably involves the cerebrum, causing visual hallucinations. The colored vision is really a hallucination. The confused vision is due to central functional impairment which, in turn, is due to the drug. Colored positive scotomas were present in one of my cases and are mentioned in the literature. Sometimes, as mentioned, there is some mental impairment, but my patients knew they were perceiving something that did

not exist. The temporary complete blindness mentioned in the literature probably was due to cerebral intoxication; that is, a cortical type of blindness was induced which disappeared on stopping the drug.

The dose of digitalis required to produce visual symptoms is variable. Two of my patients were on what is considered a normal maintenance dose (table 1). They were receiving  $1\frac{1}{2}$  grs. (0.1 gm.) daily of the powdered leaf—that is, 1 cat unit, which is approximately the amount utilized daily.<sup>11</sup> They had no other signs nor symptoms due to the digitalis except the visual disturbances. The other patients received larger doses. This was sometimes the fault of the patient, who misunderstood the physician's directions, and sometimes it was the fault of the internist. All received the dry powdered leaf in tablet form made by reputable pharmaceutical companies. The exact component in the drug responsible for visual symptoms is unknown, but the most refined preparations may produce these symptoms as well as the crude preparations used many years ago. It does seem important to know, however, that on the dosage recommended in leading textbooks on cardiology<sup>11</sup> a patient may, infrequently, develop visual disturbances without any other symptoms.<sup>12</sup> These patients usually can take smaller doses without difficulty. Recovery from the visual symptoms after stopping the drug took from 3 to 7 days in my cases but it may take as long as 14 days.<sup>13</sup> Overdosage has resulted in death,<sup>14</sup> but apparently if the patient recovers the vision recovers, and I have so far been unable to find any convincing report<sup>10</sup> of permanent visual impairment. The only treatment usually necessary is to stop the drug—the forcing of fluids may be desirable but should probably be prescribed by the physician in charge of the patient's cardiac condition.

The diagnosis may not always be easy. One of the author's patients who complained of black floating specks and bright shiny spots had vitreous opacities and a diabetic retinopathy which was thought to be sufficient to explain her symptoms. However, when she discontinued her normal maintenance dosage of digitalis the annoying bright spots disappeared, leaving only the others to which she had long been accustomed. She is able to take about half the average dosage without developing symptoms. Another elderly patient with lens and vitreous opacities complained of black streaks and flashing lights. It was only by stopping the drug temporarily and having these symptoms disappear that the diagnosis was made certain. Usually, however, if the possibility of this condition is kept in mind there will be little difficulty in making the diagnosis.

### SUMMARY

This is a report of six patients who had visual symptoms due to digitalis. These consisted in colored vision—chiefly white, green, yellow, or red—flashes of light,

positive colored scotomas, and other visual hallucinations. There was no change in the visual acuity or fields of these patients, but the literature suggests that if the intoxication is sufficiently profound a temporary cortical type of blindness may result. This condition may occur in patients receiving what is considered a normal dosage of the drug and may be the only symptom present. Recovery takes place within two weeks after stopping the digitalis.\*

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\* Since presenting this paper the author has, in routine office and clinic practice, observed six more patients with visual symptoms due to digitalis, making a total of 12 such patients seen by him. Visual complaints included "the sensation of looking through water," "colored streaks and stars," "blue flowers," "serpents," "yellow and red spots," "ornaments," white vision, and shimmering lights. All these symptoms vanished within a week when the dose of digitalis was decreased even though several of these people were on a so-called "maintenance dose" of 0.1 gm. daily. There is a tremendous variation in the dose necessary and tolerated by cardiac patients. Each person's dose is an individual problem. It is obvious that visual symptoms are not infrequent.

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# COMPLETE CONGENITAL PIGMENTATION OF THE OPTIC DISC

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Congenital pigmentation of the optic disc is of comparatively rare occurrence, and references to it in the literature are infrequent. While several types of pigmentation have been recognized, few cases of entire pigmentation of the papilla have been reported. Sobánski observed a case of complete pigmentation of the disc. From a survey of the literature he found only two cases which he believed to be similar. Hirschberg described a color of uniform dark slate gray upon which the retinal vessels were scarcely visible. Forster referred to the pigmentation of the disc as shades of dark smoked glasses. These men were of the opinion that the condition was a congenital anomaly—a melanosis of the optic nerve.

Juler and Mann referred to three main types: (1) Dense isolated plaques which might occupy a sector of the disc and extend into the surrounding retina. These might appear black with otherwise normal eyes, or might be confined to the physiologic cup and be brownish gray in color. (2) As linear markings, commonly found on the temporal side near the disc edge, and curved concentrically with it. (3) As lacelike pigmented veils, closely associated with the blood vessels.

Thomson and Ballantyne reported a case of pigmented colobomata of the optic disc in a myopic patient in whom both discs presented an unusual picture. The appearance of the right disc was as if a wedge had been cut out of its outer and lower portion. This colobomalike wedge contained a network of brown pigment situated below the level of the disc surface. In the left eye, the pigmentation was similar, but instead of extending to the very edge of the disc it was separated from it by a narrow band of nerve tissue.

Reese mentioned small, isolated, clearly demarcated dots of jet-black pigment located superficially in the nerve-fiber layer of the disc. Small pigmented spots do not appear to be rare. Ogawa observed seven cases of this type in which the pigment was distributed indiscriminately over the disc. He believed that these spots are not necessarily associated with any other abnormal pigmentation of the eyeball and that they do not interfere with vision. Of an allied nature are rare instances of pigmentation of the entire disc.

Coats, in describing two classes of congenital pigmentation, was of the opinion that the isolated black spots are due to a pigmented lamina cribrosa. His second group comprised pigmented craterlike holes in the disc. The same author advanced the hypothesis that in certain groups of congenital anomalies, any part of the secondary vesicle and optic stalk may differentiate, perfectly or imperfectly, into any type of tissue normally from the optic outgrowth; for example, pigmented epithelium, unpigmented epithelium, retina, or neuroglia. These might occur in the following situations: (1) on the iris, (2) on the ciliary body, (3) on the retina, and (4) on the optic nerve. Consequently, it should be possible to find any of these four kinds of tissue in the optic nerve or in the eye proper. From these observations the idea may be advanced that, in congenitally abnormal eyes, a part of one layer of the secondary optic vesicle can develop into structures which normally originate in the other, or in a different part of the same eye.

Roll described a case of congenital pigmentation of the optic disc complicated with retinitis diabetica. The vision was reduced as a result of the macular exu-



dates and hemorrhages. The left eye had a visual acuity of 6/9 uncorrected. The optic disc appeared normal in outline with its contour uniformly black, contrasting with the surrounding fundus. He believed it to be congenital because of the even distribution of the color of the disc.

Goldenburg reported a case of anomalous optic nerve head in both eyes of a Negro. Corrected vision in the right eye was 20/40, and in the left, 20/25. Ex-

complete and very distinct ring of pigment. The picture in the right eye was similar, but to a lesser degree. The eye grounds showed old inflammation, but no pigmentation.

Zentmayer described the case of a Negress, 27 years old, who complained of asthenopia, pain in the right side of the head, and recurrent styes. In the right eye there was a small vacuole in the lens. The papilla was oval, axis 95 degrees, with a large excavation involving four fifths of its surface. Within the excavation on the temporal side, a dark-gray crescent was present. The pigment seemed to be on the outer wall of the excavation. Contiguous with this, outside of the excavation, which extended to the scleral ring, there was a cone of the same tint. The picture in the left eye was identical.

Recently, Kravitz reported three cases of partial pigmentation of the optic disc; in all, the vision was correctable to 20/20. The fundi were entirely normal except that the temporal disc quadrants revealed slate-colored pigmentation. In each case he referred to a cilioretinal artery, but could not explain its significance. The fields showed no defects; neither holes nor colobomas were present in the pigmented area.

Undoubtedly the greater percentage of these pigmented discs are discovered through the routine examination of the fundus. It is most unusual for them to cause any disturbance in vision or to change in appearance during a period of observation. The case to be presented occurred in a patient who entered the Kings County Hospital Eye Clinic. Chronic glaucoma was present in the left eye. The pigmented disc in the right eye was discovered during routine fundus examination. This patient has been under treatment for chronic glaucoma of the left eye since January 9, 1939. During this interval, the pigmented papilla has not

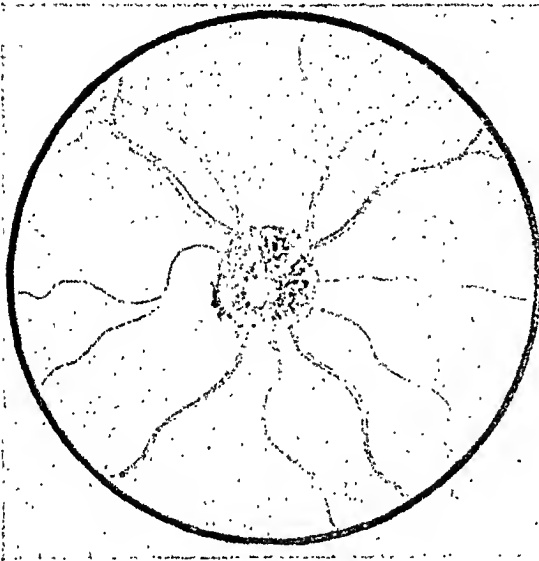


Fig. 1 (Moehle). Complete congenital pigmentation of the optic disc.

amination of both fundi revealed an unusual anomaly. The nerve head could not be differentiated, but there appeared to be a marked and intense pigmentation in the region of the nerve head which gradually became lighter toward the periphery. The disc margins could not be made out, and the retina showed a diffuse and light pigmentation. The fields were contracted to 20 degrees up, in, and down, and 50 degrees out.

Neeper reported the case of a woman 20 years of age who complained of a "burning back of the eyes." The vision in the right eye was 20/20, and in the left, 20/40. The disc of the left eye showed a

changed in appearance, and has remained consistently confined to the disc proper. There has been no change in the visual acuity.

#### CASE REPORT

M. M., a man, aged 65 years, came to the eye clinic on January 9, 1939, with a history of poor vision in the left eye. A diagnosis was made of chronic glaucoma, which was controlled for a time with pilocarpine hydrochlorate. He was admitted to the Hospital on January 15, 1939, and an Elliot trephining was performed on January 18, 1939. This failed to control the tension or to improve the vision. Later, a cyclodialysis controlled the tension, but not the vision, which subsequently became nil.

Examination revealed bilateral weakness of the lid levators. Extraocular movements were normal; tension to the fingers was increased in the left eye, normal in the right. The left eye showed iris atrophy and posterior synechia at the 6-o'clock position. There was deep excavation of the disc of the left eye, with vessels bending over the edge. The disc was nonpigmented. The right eye showed a papilla with brownish-black pigmentation which was not elevated, but was distributed over the entire disc, covering some of the retinal vessels. In the upper and temporal quadrants, dense granules

ranged to plaquelike areas of pigmentation. At no time has the vision in this right eye gone below 20/30; the best vision was 20/20 uncorrected. Refractive error of the right eye, plus two diopters. The tension in the right eye has varied from 17 mm. Hg to 25 mm., but at no time has it gone above 25 mm. (Schj  tz).

Laboratory findings: Urinalysis negative; Wassermann test negative. Blood chemistry: urea, 27 mg. per 100 c.c. of blood; blood sugar, 76 mg. per 100 c.c. of blood. Blood pressure, 134 systolic, 84 diastolic. The chest film showed an elongation and torsion of the aortic arch. There were prominence of the bulb of the aortic arch and sclerotic changes *in situ*; also a preponderance of the left ventricular contour of the heart border and accentuation of the pulmonic markings in the mesial lung fields. The cardiac status is that of arteriosclerotic and hypertensive heart disease.

Visual fields on January 17, 1939: right eye, nasal 30 degrees below 50 degrees, temporal 58 degrees above 30 degrees. Left eye, nasal 20 degrees below 40 degrees, temporal 55 degrees above 25 degrees. From January 17 to April 14, 1939, the fields in the right eye remained constant, whereas in the left eye the fields diminished progressively to fixation.

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## PENICILLIN IN THE TREATMENT OF PERFORATING OCULAR INJURIES AND IN UVEITIS\*

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There are two problems in ocular therapy that are of interest to the Armed Forces. One is the treatment of perforating wounds of the globe which subsequently become infected; the other is the problem of uveitis, for the therapy of this condition to date is relatively unsatisfactory. The penicillin studies to be discussed indicate at least a partial answer to both of these problems.

### PERFORATING INJURIES OF THE GLOBE

The report of Cashell<sup>1</sup> on penicillin treatment of an infected injured eye prompted a further investigation of the subject at the AAF School of Aviation Medicine. With regard to the treatment of these cases, Cashell advised the use of penicillin eyedrops every half hour during the first 24 hours, and, if possible, the instillation of penicillin into the anterior chamber. No mention is made of any systemic administration of penicillin, either by the intravenous or intramuscular route. It was decided to attempt experimental confirmation of Cashell's clinical results and at the same time study various methods of local administration of penicillin.

### EXPERIMENTAL

Rabbits were chosen as the experimental animals, but no albinos were used, since the presence of iris pigment was considered desirable. The perforating ocular injuries were produced with a pair of small, sharp-pointed scissors with blades slightly opened. The perforations were made in clear cornea, about 2 mm. from the limbus, at the 12-o'clock position. An attempt was made to injure the lens purposely in every instance. Following the perforation, 0.05 to 0.10 c.c. of a 24-hour broth culture of a virulent strain of hemolytic *Staphylococcus aureus* was injected directly into the anterior chamber via the perforation. The chosen strain of staphylococcus was tested and found to be susceptible to penicillin. The infections thus produced in the rabbit eyes were arbitrarily divided into three categories on the basis of their clinical appearance:

1. Mild—cornea diffusely clouded but no hypopyon, and entire iris visible.
2. Moderate—cornea cloudy and hypopyon present, but iris partially visible.
3. Severe—no iris visible, either because the anterior chamber was filled with pus or because the cornea

\* From the Department of Ophthalmology, AAF School of Aviation Medicine.

became completely opaque; marked chemosis and palpebral edema also present.

The following routes of penicillin administration were utilized in the following manner:

A. *Anterior-chamber lavage.* The right eye received penicillin; the left eye was used as a control. A daily paracentesis was performed with a Graefe knife and following this the anterior chamber of the right eye was lavaged with a solution containing 500 units of penicillin per cubic centimeter in 0.9-percent saline. The left eye was similarly lavaged but with 0.9-percent saline alone. Two daily instillations of 1-percent atropine solution were made in each eye.

B. *Subconjunctival injection.* The right eye received penicillin; the left eye was used as a control. Daily subconjunctival injections were made in each eye, the right eye receiving 500 units of penicillin in 0.9-percent saline whereas the left eye received only 0.9-percent saline. Both eyes received two daily instillations of 1-percent atropine solution.

C. *Eyedrops.* The right eye received penicillin; the left eye was kept as the control. Drops were instilled four times daily, a solution of 500 units of penicillin per cubic centimeter of 1.4-percent saline solution (pH 7.0 to 7.2) being used in the right eye whereas a 1.4-percent saline solution only was used in the left eye. In addition, both eyes received two daily instillations of 1-percent atropine solution.

D. *Intravenous route.* Each rabbit received two daily injections of 1,000 units of penicillin in 0.9-percent saline intravenously. In addition, both eyes received two daily instillations of 1-percent atropine solution.

E. *Intravenous route plus eyedrops.* The right eye received penicillin while the left eye served as a control. In addition

to two daily intravenous injections of 1,000 units of penicillin in 0.9-percent saline, the right eyes received drops containing 500 units of penicillin per cubic centimeter of 1.4-percent saline four times daily whereas the left eyes received only 1.4-percent saline drops four times daily. In addition 1-percent atropine was instilled into each eye twice daily.

A minimum of six rabbits was used to test each method of penicillin administration. The results were comparable in each of the four groups and only the typical results will therefore be described.

## RESULTS

*Anterior-chamber lavage* was satisfactory in controlling only those ocular infections classified as *mild*, whereas those considered moderate and severe were not at all controlled by this method of penicillin therapy.

*Subconjunctival injections* of penicillin in saline were satisfactory in controlling both *mild* and *moderate* ocular infections. Not only did they not control the severe infections, but subconjunctival injections actually made the eyes worse and frequently would lead to spontaneous perforation of the globe within 36 hours. The irritant effect of subconjunctival injections of saline alone is well known, and the addition of penicillin to the solution in no wise minimized this effect.

*Intravenous injections* of penicillin were satisfactory in controlling only the *mild* ocular infections and did not control the moderate or severe ones at all.

*Eyedrops* containing penicillin were satisfactory in controlling the *mild* and *moderate* ocular infections but not the severe ones.

*Penicillin eyedrops plus intravenous injections* of penicillin satisfactorily controlled all *mild* and *moderate* infections as well as slightly over 50 percent of the *severe* ones (see table 1).

TABLE 1

RESULTS OF PENICILLIN THERAPY OF EXPERIMENTALLY INFECTED EYES OF RABBITS AFTER PERFORATING INJURY

Method of Treatment	Type of Infection		
	Mild	Moderate	Severe
Anterior-chamber lavage	Satisfactory	Unsatisfactory	Unsatisfactory
Subconjunctival injection	Satisfactory	Satisfactory	Unsatisfactory (even dangerous)
Eyedrops	Satisfactory	Satisfactory	Unsatisfactory
Intravenous injection	Satisfactory	Unsatisfactory	Unsatisfactory
Eyedrops and intravenous injection	Satisfactory	Satisfactory	Satisfactory (in over 50% of cases)

## DISCUSSION

It is apparent from these animal experiments that no single route of penicillin administration is satisfactory in controlling all ocular infections following perforating injuries, even though the etiologic organism is susceptible to penicillin. However, the combination of penicillin eyedrops and intravenous injections of penicillin would seem to be satisfactory, since it was effective in over 50 percent of the severe ocular infections.

Certainly there can be no objection to the installation of penicillin in saline directly into the anterior chamber during the surgical repair of an ocular perforation as a prophylactic measure, nor is there any objection to adopting the same procedure at a later date. However, it is felt that no great benefit was derived except in cases of mild infections in addition to the distinctly prophylactic value. Certainly the efficacy of anterior-cham-

ber lavage cannot compare therapeutically with the benefit obtained from administering penicillin by various other routes.

Use of the subconjunctival route involves certain dangers, particularly in the hands of one not too familiar with ocular pathology. The clinical appraisal of the severity of an ocular infection may not necessarily agree with the true histopathologic picture and since this route will apparently only make a *severe* infection worse, the possible hazard to the eye becomes apparent. It would seem that a severely inflamed eye simply will not stand the added insult of a subconjunctival injection.

The combination of penicillin eyedrops plus penicillin injected intravenously would seem to be the most satisfactory method of handling all ocular infections following perforating injuries. The drops should be made up in a strength of from 250 to 500 units of penicillin per cubic

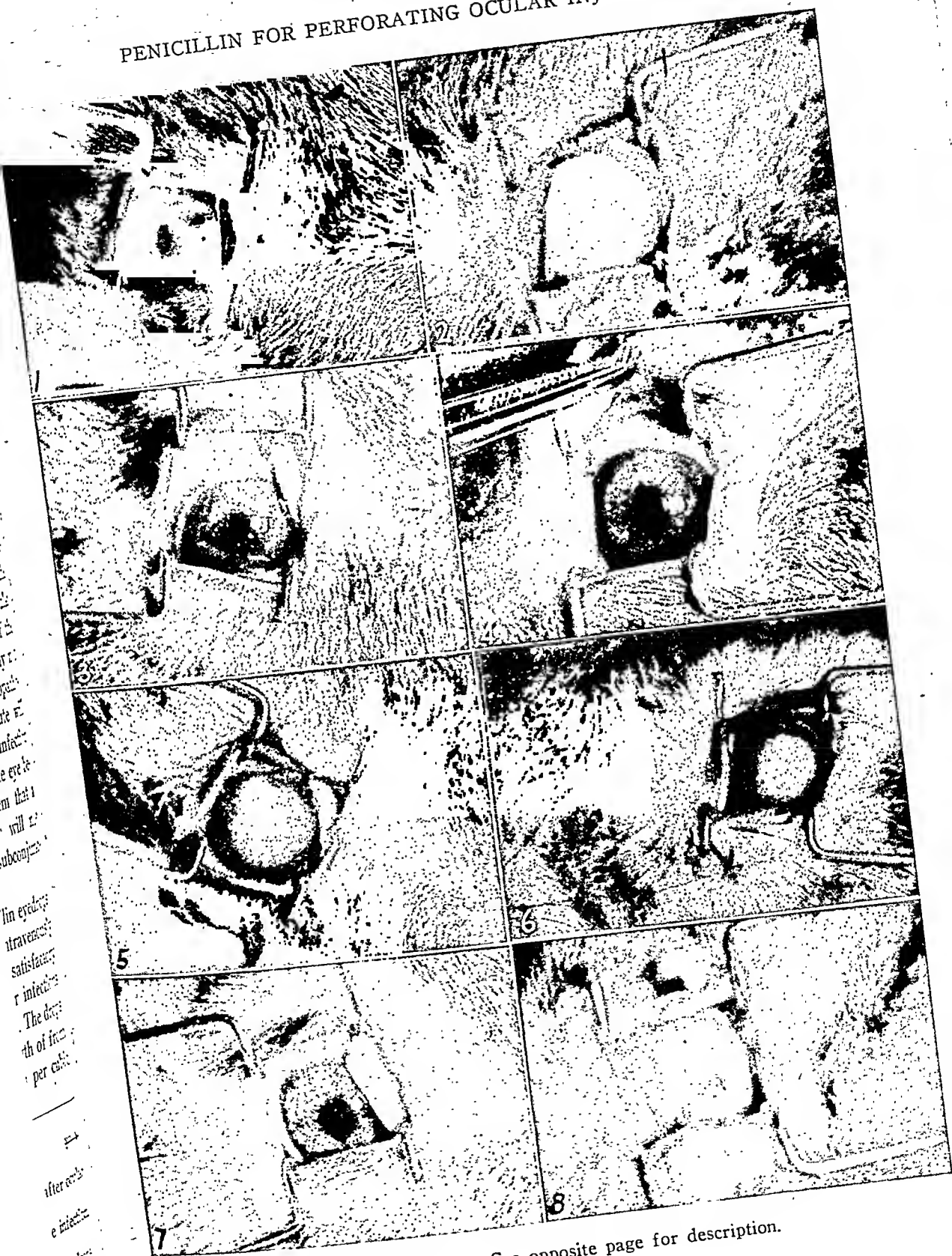
Figs. 1-8 (Scobee). Penicillin treatment of experimentally infected eyes of rabbits after ocular injury.

Figs. 1 and 2. Right (fig. 1) and left (fig. 2) eyes of a rabbit having a moderate infection. The right eye received penicillin eyedrops; the left received only saline drops.

Figs. 3 and 4. Right eye (fig. 3) with a moderate infection treated with penicillin eyedrops. The left eye (fig. 4) of the same animal received penicillin subconjunctivally; it also was a moderate infection. The clinical outcome was essentially the same.

Figs. 5 and 6. Right and left eyes of one of the control animals. Both eyes had a mild infection and the only treatment used was 1-percent atropine eyedrops.

Figs. 7 and 8. Right (fig. 7) and left (fig. 8) eyes of an animal receiving penicillin intravenously, penicillin eyedrops in the right eye, and saline drops in the left eye.



Figs. 1-8 (Scobee). See opposite page for description.

centimeter of a 1.4-percent saline solution. This saline concentration instead of the usual 0.9 percent should be used inasmuch as it is isotonic with tears and allows greater penetration of penicillin into the eye; moreover, this concentration is less irritating than any other to the ocular tissues. The pH of the drops should be regulated between 7.0 and 7.2. The addition of the cationic detergent, zephiran,<sup>2</sup> is of value despite reports that another of the wetting agents, aerosol, actually seems to inhibit the action of penicillin.

The interesting question of adequate dosage of penicillin in ocular infections arises. Cashell states: ". . . compared with the dosages required in other branches of medicine and surgery, the amount necessary for the adequate treatment of all acute ocular infections in an ophthalmic unit is small." Certainly our own experience is in complete agreement. The work of Struble and Bellows<sup>3</sup> with regard to ocular-tissue concentrations attained after intravenous administration of penicillin tends to confirm Cashell's remarks. Also, the work of Leslie<sup>4</sup> and that of Crawford and King<sup>5</sup> indicate that the very frequent use of penicillin eyedrops—that is, every 30 minutes—may not be necessary, since both reports indicate a persistence of bacteriostatic concentrations of penicillin in the conjunctival sac for periods of from three to five hours after the instillation of eyedrops.

On the basis of animal experiments alone, a suggested therapeutic régime for ocular perforations of eyes which subsequently become infected is: (1) 25,000 units of penicillin in 0.9-percent saline given intravenously every 12 hours, and (2) the use of penicillin eyedrops in a strength of from 250 to 500 units of penicillin per cubic centimeter of 1.4-percent saline every four hours.

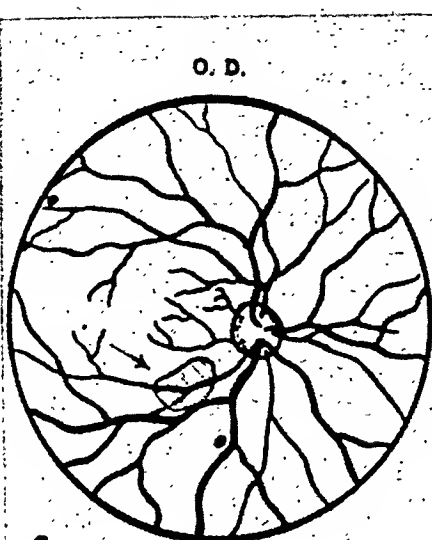
One interesting but unexplained ob-

servation in the experimental work is the fact that within certain limits, the larger perforations gave a better response to penicillin therapy than did the small ones. Another obvious fact which emerges is that the sooner penicillin therapy can be initiated following the injury, the better will be the final result.

#### UVEITIS

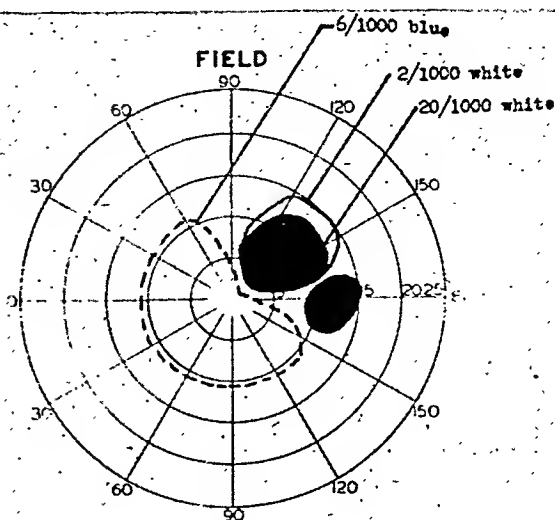
There is prevalent at the moment an idea that penicillin is of absolutely no value in the treatment of so-called nonspecific uveitis. Studies at the AAF School of Aviation Medicine carried out with the coöperation of the Randolph Field Station Hospital furnish a partial negation of this idea. In 75 percent of cases of nonspecific uveitis—that is, where no causative organisms could be discovered—penicillin seemed to have a marked effect. It should be emphasized that *in no instance was a complete cure effected with penicillin alone*. However, in the majority of cases, a marked improvement occurred in the clinical appearance of the eye within 48 to 72 hours after the initiation of penicillin therapy. This observation has been confirmed by personal communication with a number of other investigators. Cases of both anterior and posterior uveitis are in the series and it is regretted that their actual number cannot be revealed for reasons of military security.

In all cases of uveitis, the patient was first given a thorough general examination in a search for possible foci of infection. Serologic and tuberculin tests as well as any other indicated laboratory work were done. In only one case could a possible etiologic agent be uncovered. All patients received penicillin in a dosage of 25,000 units in 0.9-percent saline (2.5 c.c.) every four hours—a total of 150,000 units per day. The duration of treatment varied from 5 to 12 days.



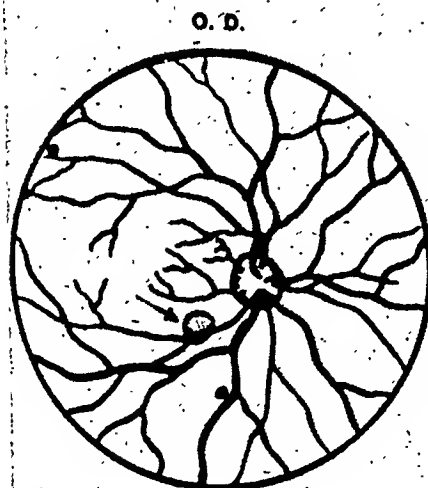
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DATE 14 March 1944



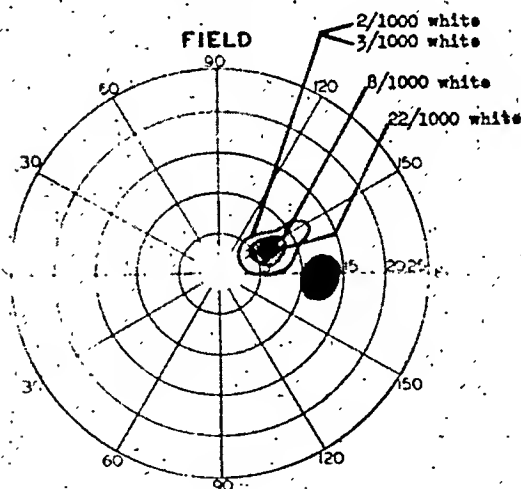
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EXAMINER R. G. Scobee



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DATE 22 March 1944



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EXAMINER R. G. Scobee

Figs. 9 and 10 (Scobee). Penicillin therapy of human uveitis. Fig. 9. Fundus diagram and central fields of a patient with posterior uveitis.

Fig. 10. Fundus diagram and central fields of patient in figure 9 four days after initiation of intramuscular penicillin therapy.

In addition, 1-percent atropine was instilled into the involved eye three times daily. No other treatment was given.

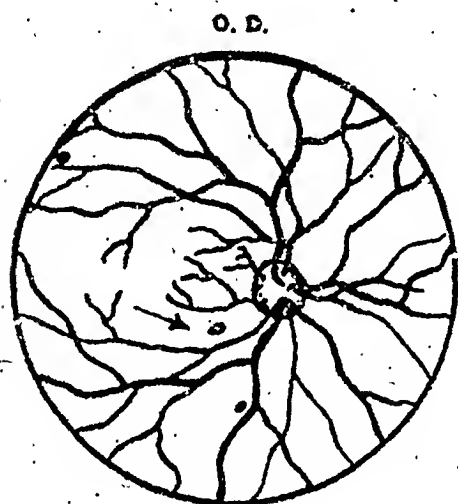
In cases of anterior uveitis, an aqueous flare would fade away within 36 to 48

hours, freely moving cells would disappear from the aqueous, and keratic precipitates would shrink and become crenated in the same period of time. There would be a concomitant improve-

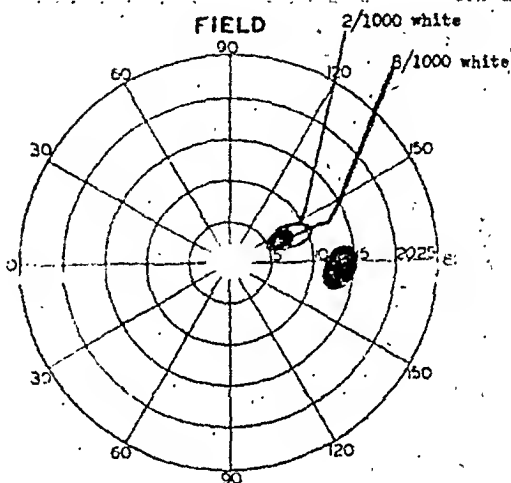


ment in visual acuity. Although 75 percent of the cases showed the marked improvement mentioned, *if the patient received nothing but systemic penicillin and atropine drops as described, relapses would invariably occur in from five to seven days.* This recurrence of the clinical signs of activity of the inflammatory process was seldom as severe as the original one but was, nevertheless, present.

answer to the problem of the therapy of uveitis, but it is our feeling that it should by all means be considered an adjunct. The results in uveitis when penicillin was used indicated that, in what have heretofore been considered cases of nonspecific origin simply because of the apparent absence of any infectious foci, nevertheless 75 percent of the inflammatory manifestations were most likely the result of



NAME E.W.J.  
DATE 21 April 1941



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EXAMINER R. G. Scobee

Fig. 11 (Scobee). Fundus diagram and central field of patient in figure 9 about five weeks after penicillin therapy. The lesion has been perfectly "quiet" for over two weeks. The relapse in this case occurred in the form of a mild anterior uveitis six days after the initiation of penicillin treatment.

A similar picture was found in cases of posterior uveitis or chorioretinitis. Chorioretinal exudates were observed to shrink rapidly in size, in many cases, upon systemic administration of penicillin in doses of 150,000 units per day. There was a concomitant decrease in the size of the scotomata produced by these lesions in keeping with their clinical appearance of improvement. Figures 9, 10, and 11 show the clinical course of a typical case.

Penicillin is certainly not the complete

an infectious focus, as evidenced by the response to penicillin. The fact that these cases improve on penicillin therapy seems strongly indicative of a bacterial origin rather than an allergic one, or the effect of the penicillin-resistant tubercle bacillus.

If 75 percent of patients with non-specific uveitis receive such an apparent therapeutic "boost" from the use of penicillin, and if there is no contraindication to the simultaneous administration of foreign protein, vasodilators, or

salicylates with penicillin, then certainly the patient should not be denied the possible benefits of the drug provided it is available.

#### SUMMARY

A study of various routes of penicillin administration in therapy of perforating injuries of eyes which subsequently become infected has been made. These include anterior-chamber lavage, subconjunctival injections, eyedrops, and intravenous injection. Of these, only a combination of the eyedrops and the intravenous route was at all satisfactory in controlling severe ocular infections. On the basis of experimental work alone,

a possible therapeutic régime in such cases is suggested.

Penicillin is not the entire answer to the therapy of uveitis; it is quite definitely an adjunct. Seventy-five percent of uveitis cases showed a marked and rapid improvement in clinical signs within 48 to 72 hours of the initiation of penicillin therapy. In no instance was a complete cure effected with penicillin alone, and if no therapy other than penicillin was employed, relapses almost invariably occurred in from five to seven days. Nevertheless it is felt that any patient with uveitis should have the benefit of this therapy if the drug is available.

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# CONGENITAL GLAUCOMA AND CATARACT, BILATERAL; GONIOTOMY AND NEEDLING\*

## CASE REPORT

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*Chicago*

In December, 1921, there appeared in the *American Journal of Ophthalmology* an article by Dr. H. Gifford, of Omaha, Nebraska, in which he recounted his experience and that of his associate, Dr. James M. Patton, with the Curran peripheral iridotomy in the treatment of glaucoma. Curran had written several articles<sup>1</sup> explaining the new procedure and giving his explanation for the resultant beneficial effects. The technique was a slight modification of the transfixation of the iris as it is usually done for iris bombé. The modification consisted in cutting through the bridge between the two holes in the iris, thus making a tongue flap. It was "necessary to cut toward the iris base." If one cut slightly into the inner surface of the cornea it did not complicate the operation unless undue hemorrhage resulted.

As I read Dr. Gifford's article it occurred to me that the benefit occasionally achieved was probably due to cutting into the region of the canal of Schlemm and not to the iridotomy, and I so wrote Dr. Curran immediately. I talked it over with Dr. Wilder, but he did not seem impressed, and I consequently dismissed the idea. I did not, at the time, know of the De Vincenti operation.

When Dr. Otto Barkan<sup>2</sup> brought out his operation of goniotomy under direct observation my interest was kindled anew, because (1) we had begun to study the iris angle under the gonioscope, both before and after various types of

operations, and (2) it seemed to me that by this means we should obtain the advantages of iridectomy without losing aqueous. When one loses aqueous the iris comes to lie against the corneal endothelium, and disturbance of that thin layer of cells is often followed by adhesions between the iris and cornea; adhesions which usually nullify the very purpose of the operation—that is, they interfere still further with the escape of the aqueous.

I tried several times to perform the operation as nearly as I could according to Dr. Barkan's technique, but found it impossible (1) to keep fluid under the contact glass while inserting the knife, and (2) to keep the area of operation in focus. I tried then, after thorough study of the angle preoperatively, to reach the trabecular angle without using the contact glass. It seemed to me it should be no more difficult than to pass a cataract knife across a chamber; neither can be done satisfactorily across a shallow chamber. But if the chamber is normally deep, especially if by gonioscopy one can see the trabecular area, one should be able to engage that area with the point of a knife.

It was difficult to force the Knapp knife (Curran's and Gifford's suggestion) clear through to the opposite side of the chamber, owing to the fact that the Knapp knife has a conical shaft (that is, the shaft 10 mm. from the point is thicker than it is 6 mm. from the point) and in forcing it through, the eye turned and the landmarks were displaced. The same thing was true of the Barkan

\* Presented at the eightieth annual meeting of the American Ophthalmological Society, at Hot Springs, Virginia, June, 1944.

goniotomy knife, which otherwise seemed perfect. However, in several cases satisfactory results were obtained which have been permanent. Some of these have already been reviewed,<sup>3</sup> and others will be reviewed at a later date.

The purpose of this paper is to give a single case report of a male baby, five months old, who had congenital cataracts and one hydrophthalmic eye; the other eye had a hypertension but was never hydrophthalmic. Goniotomy was performed four times on the hydrophthalmic eye and once on the other eye, as a result of which the tension was normalized, so that atropine could be used freely. Following these procedures each lens was needled once. A good red reflex in each eye resulted, and a careful study of the nonhydrophthalmic eyegrounds has been made; the disc is of normal color and outline, is not depressed, and there is normal physiologic cupping. Both eyes have been repeatedly studied gonioscopically by several members of the staff of the Illinois Eye and Ear Infirmary. The pupils are central and react to light, the corneas are clear, and the baby has enough vision without his glasses so that he can see and play with his toys. Although he is now 2 years and 4 months old, he does not walk and he is definitely slow in talking. The ears are slightly prominent and are proportionately large for the head.

#### CASE REPORT

Kenneth K. was first seen at the Illinois Eye and Ear Infirmary on May 23, 1942, when he was five months old. A diagnosis was made of R.E., cataract; L.E., hydrophthalmos and cataract. The mother first noted a clouding of the left eye when the baby was six weeks old. Gradually the left eye became larger than the right, and the clouding of the cornea remained. He was the only child, was not

born prematurely, and the delivery was spontaneous. The mother was ill for about six weeks during the first part of the pregnancy. There were no eye defects in any member of the mother's or father's families, nor tuberculosis, syphilis, diabetes, nor malignancy. There had been no infection in either eye.

*Findings.* The cornea of the right eye was 10 mm. in diameter; of the left eye 12.5 by 13 mm. The anterior chambers were of normal depth, the irides blue-gray, the pupils 2.5 mm. in diameter. The cornea of the right eye was clear; that of the left generally a little gray. There was a central opacity in each lens, and a red reflex was seen only on ophthalmoscopic examination. Nystagmus was present. The head was somewhat small (no measurements were taken), but there were no gross abnormalities of the head or body. Pilocarpine 1 percent was ordered for the left eye q.i.d.

May 26, 1942. With the child under ether anesthesia, no change was observable in the appearance of the eyes. Tension was R.E. 31 mm. Hg (Schiotz) (normal 12 to 24); L.E. 46 mm. Hg. Transillumination induced a good glow throughout.

*Operation.* The goniotomy knife was inserted at the limbus of the left eye at the 3-o'clock position, passed across the pupil to 9:30 o'clock, and swept down in the angle to 7 o'clock—that is, in the inferior nasal quadrant. Bichloride ointment and bandage were applied.

On the next day the cornea of the left eye appeared less cloudy. Pilocarpine 1 percent was ordered for each eye q.i.d. for two days and to be continued R.E. q.i.d.

The child was reentered on June 30, 1942, and discharged July 2d. Pilocarpine 2 percent was ordered R.E. t.i.d. R. and L. tension +1 (fingers).

L.E. Gonioscopy preceded the operation, performed under general anesthesia.

The cornea was still somewhat cloudy, precluding good visibility. Four of us agreed that there were two small areas at about the 7- and 9-o'clock positions together occupying possibly 25 degrees of arc, where the iris and its attachment to the sclera were pulled away and lay somewhat behind the plane of the rest of the iris; that is, there seemed to be a depression of the plane of the iris (internal cyclodialysis?). Elsewhere there were trabecular synechiae, and especially at the 2:30- and 3-o'clock positions; at the site of the original puncture there was a denser synechia.

*Operation.* Left eye: Again the knife was inserted at the 3-o'clock position and passed across to engage the trabecular region at 11 o'clock. A slight cut was made circumferentially to 2 o'clock—that is, in the upper quadrant. After withdrawal of the knife a slight amount of blood escaped into the anterior chamber. Bichloride ointment and bandage were applied.

Pilocarpine was continued in R.E.

July 16, 1942. Tension, R.E. was 19; L.E. 22 mm. Hg (local anesthesia).

The child reentered the hospital on September 15, 1942, and was discharged on September 19, 1942. Under ether anesthesia, tension R.E. was 30; L.E. 26 mm. Hg.

*Operation.* At this time goniotomy was performed on each eye, for it was evident that the medication used was not sufficient to control the tension of the right eye and the two previous operations were not sufficient for the left eye.

R.E. Entry was made at the 9-o'clock position; the needling knife was passed across to 2:30 and swept upward to 12 o'clock—that is, in the upper nasal quadrant.

L.E. Entry at 9 o'clock; the needling knife was passed across to 2:30 and swept downward to 5 o'clock—that is, in the lower temporal quadrant.

A few pinpoint spots of hemorrhage resulted along the root where the incision was made.

Pilocarpine was ordered, 1 percent R. and L., q.i.d. for two days postoperatively.

The child reentered the hospital on September 29, 1942, and was discharged on October 1st.

*Operation.\** Under general anesthesia, goniotomy was performed on the left eye. Puncture was made at the 9:30-o'clock position, the incision extending upward from 3 o'clock to 12 o'clock—that is, the upper temporal quadrant. Very slight bleeding occurred at the 3-o'clock position. The patient was put on his right side. The anterior chamber re-formed in a few minutes.

On October 1, 1942, the tension L.E. was slightly soft (fingers).

Between October 20th and November 20th the tension O.U. was in the 20's, not increased with atropine.

The child reentered the hospital on December 8, 1942, and was discharged on December 11th. The right eye was needled under general anesthesia.

The child reentered the hospital on April 20, 1943. Under ether anesthesia the tension was R.E. 21; L.E. 22 mm. Hg. Atropine was instilled in each eye. The pupil of the right eye measured 3 mm.; that of the left 4 mm. The media of the right eye were clear, the disc was clearly seen. There was normal physiologic cupping; no atrophy. Retinoscopy, +16.00D. sph. at 0.5 meter.

Gonioscopy, R.E.—there was a good angle; the root of the iris was depressed in the area that had been operated on. L.E.—there was a good angle temporally especially from the 2:30- to the 3:30-o'clock position and nasally from 8:30 to

\* Details of this preoperative examination were not found on the hospital record.

10 o'clock, with a depression of the root of the iris.

*Operation.* The left eye was operated on by needling horizontally with a Ziegler knife from the 9- to the 3-o'clock position. A good opening was obtained. Atropine was omitted.

Glasses were ordered as follows: O.U. +13.00D. sph.; add +4.00D. sph. ultex bifocals.

March 28, 1944. The nystagmus continued O.U. The patient did not like his glasses.

The corneas were clear; the pupils R. and L., 2 mm. in diameter. The tension was R.E. 23; L.E. 15 mm. Hg (butyn anesthesia).

The cornea of the right eye was 11+ mm. in diameter; that of the left 12+ mm. The patient has had no treatment for 11 months.

May 3, 1944. The patient was 2 years, 4 months old.

He had been quite ill following the last examination on March 28th, but recovered. He finds his toys and avoids objects; crawls with ease and rapidity. He stands, but not well; does not walk. The eyes do not tremble so much, especially toward evening. No redness of either eyes was observed. The muscles are all active, but he tends to look upward for the most part. The scleras are not especially blue.

The cornea of the right eye was 11+ mm.; of the left eye 12+ mm. in diameter.

The pupil of the right eye was 2 mm. and 1.5 mm. red reflex. The pupil was almost round and almost exactly central.

The pupil of the left eye was 2+ mm. and 1.5 mm. red reflex—almost round. The pupil was very slightly nasally placed.

Each anterior chamber was deep. Under ether anesthesia photographs were taken. The tension was R.E. 20, L.E. 16 mm. Hg. The cornea of the right

eye was 11.25 mm., of the left eye 12.5 mm. in diameter.

Gonioscopy, L.E. only. The patient was examined by Drs. McGarry, Haas, Kronfeld, and Allen. At the 9-o'clock position a small area of ciliary body was seen between attenuated adhesions (anterior synechiae). At the 10-o'clock position there were four extensions of iris (McGarry) to the trabecular region. Just anterior to the ciliary body was a small area which may lead into the Schlemm canal. Between 4 and 5 o'clock there is a similar longer and deeper groove which seems to lead in to the sclera, posterior to Schlemm's canal.

#### SUMMARY

In brief review, we have here the case as a 5-month-old child with congenital glaucoma of low grade in one eye and early hydrophthalmos in the other; in each eye there was an associated cataract. The tension under narcosis was 31 and 46 reduced to 20 and 16 mm. Hg by one and four goniotomies, respectively; subsequently atropine, used previous to needling, did not raise the pressure. A single needling only was necessary in each eye. The result was a clear, centrally placed, round pupil in each instance, and a good view of each fundus was obtained. The vision without glasses is sufficient to allow the child to play with his toys; unfortunately it is too early as yet to estimate the acuity more accurately.

#### CONCLUSION

This method is not advocated as universally applicable in all cases of deep-chamber glaucoma, nor in all cases of hydrophthalmos; it is merely intended to record what has been accomplished in this one case. The operation is not more difficult but rather less difficult than a cataract extraction. When successful it preserves the symmetry of the pupil and

the normal appearance of the eye. Should it be unsuccessful, other operations of a similar or different character can be attempted. In my opinion goniotomy—in-

cision in the angle—should be added to the operative procedures at our command in the control of early glaucoma.

*122 South Michigan Avenue.*

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## A CONTRIBUTION TO THE THEORY OF BINOCULAR VISION SUPPORTED BY THREE CASES OF LATENT NYSTAGMUS

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Latent nystagmus will be discussed in this article only insofar as it contributes to an understanding of the physiologic processes involved in binocular vision. The three cases reported herewith have been selected from a considerable number studied because they seemed best suited to illustrate the author's thesis. In order not to obscure the principal theme by a mass of unessential detail, it was deemed advisable to stress only the high points of the case histories.

#### THEORIES OF BINOCULAR VISION

The generally accepted views regarding the mechanism of binocular vision and stereopsis are based on Hering's theory<sup>1</sup> which may be briefly stated as follows: If the image of a given point in space were to fall on the fovea, it would seem that it ought to be projected back along the visual axis of that eye. However, in binocular vision this is not the case. Rather, the image is projected along the visual axis of a hypothetical cyclopic eye, or binoculus, which lies midway between the two eyes. Thus, no matter which one of the two foveas receives the image, the latter is projected in space

along the same line, which lies in the median plane of the head. Hence, the two foveas may be regarded as corresponding points. In general, any pair of points on the two retinas that are projected in space along the same line, are corresponding points. Disparate points, if the disparity is slight, help in the estimation of depth. In fact, Hering goes so far as to assign a definite depth value to any given pair of disparate points. The theory also assumes that the two eyes see simultaneously and that two independent visual sensations are registered in the cortex, these two sensations being combined somewhere in consciousness to form a single three-dimensional representation.

Verhoeff<sup>2</sup> has proposed a theory that differs materially from that of Hering. At any given moment the visual field contains some objects that are seen binocularly and others that are seen with one eye only. Yet it is impossible to detect where binocular vision ends and monocular vision begins. Hence, binocular vision cannot belong to a category different from monocular vision. Starting from this concept, Verhoeff has elaborated his

theory of "replacement," according to which the two eyes do not see simultaneously, but only one at a time. One eye will see certain portions of the whole field or of any single object, while the other eye sees the remaining portions. As in the case of binocular retinal rivalry, the portions seen by each eye are subject to momentary fluctuations, depending on the relative attention-values of the part-fields belonging to each of the two eyes. At any given moment, while one eye is occupied with the observation of one portion of space, the other eye is suppressed in this region, and in this region only. Thus the two eyes divide between each other the entire field of vision in an ever-changing mosaic of small monocular part-fields.

Verhoeff's theory carries a further implication that is of interest in this connection. When a configuration is seen binocularly, each monocular image is displaced in space to a new position corresponding to the binocular projection. This new position of a given monocular image is maintained even if a portion of the partner image is invisible. Stated in other words, even though both eyes collaborate in binocular vision, each eye retains a certain degree of independence and is able to supplant portions of the binocular field not seen by the other eye. Thus the configuration appears as an unbroken whole, the parts seen with both eyes being indistinguishable from those seen with one eye only.

This concept of the mechanism of bin-

ocular vision seems to be in accord with clinical observations. It explains, better than Hering's theory, most of the phenomena of binocular vision. However, the evidence that thus far has been brought forward in support of Verhoeff's theory was arrived at largely by introspective methods. For it is impossible to determine, by purely objective tests, which eye is fixating at any given moment; nor is it possible to detect in a normal individual to what extent the binocular field of vision replaces the monocular fields.

Observations made on patients with strabismus associated with false projection and marked amblyopia have led the present writer to conclude that good central vision is not essential to make binocular vision possible. By employing the "performance test"\* of Davidson<sup>3</sup> it may be demonstrated that most persons with amblyopia and central suppression possess at least a crude degree of binocular depth perception, since the latter becomes markedly impaired when the amblyopic eye is covered. In fact, it has seemed to the author that the overlapping of the two peripheral fields alone is sufficient to establish a certain amount of binocular depth perception. These observations, though highly suggestive, again suffer from the weaknesses inherent in subjective studies.

While engaged in this study, the writer noted that when latent nystagmus was associated with the monocular amblyopia, the effect of the amblyopic eye upon the good eye could be observed not only

\*The technique of Davidson's "performance test" is as follows:

The patient is given a 4-mm. test object which he holds vertically in front of him at a distance of 50 cm. He moves this test object downward to touch a similar test object held by the examiner at approximately the same distance from the patient. By varying slightly the position of his test object with each trial, the examiner eliminates the patient's muscle sense as a factor.

Davidson claims that binocular depth perception, as shown by this test, should be lost in the field of suppression. Yet, he admits that the 4-mm. test object provides for a visual acuity as low as 20/600. Whatever the theoretical consideration may be the fact remains that, in the author's experience, patients with monocular amblyopia and false projection show a marked facility to judge depth binocularly, as compared with monocular vision.



subjectively by the higher binocular visual acuity and depth perception as compared with the same functions in monocular vision, but the amblyopic eye also exerted an objectively observable steadying influence upon the nystagmic movements of the normal eye.

The three cases of latent nystagmus reported here will serve to illustrate the argument.

#### REPORT OF CASES

Two of the cases, being very much alike, will be considered together. Both patients were girls in their early teens. Both had insignificant refractive errors, amblyopia of the right eye, and convergent strabismus. On covering the amblyopic right eye, a very pronounced conjoint horizontal nystagmus with a slight rotatory component was produced, the rapid phase being to the left, or away from the covered eye. In both cases the vision was 20/20 with both eyes open. On covering the amblyopic eye, however, the vision of the good eye dropped to 20/40 and 20/50, respectively. Thus the amblyopic eye, although itself having a very low visual acuity (15/200 and hand movements, respectively), and false projection, was, nevertheless, able to inhibit the nystagmus and to raise the visual acuity of the good eye by at least 100 percent. This inhibitory action was not affected either by placing a +10D. lens in front of the amblyopic eye or by interposing a disc 10 mm. in diameter so as to eliminate central vision.

The third case, that of a young woman aged 21 years, differed from the others only in that it exhibited a high refractive error and a divergent strabismus of the amblyopic right eye. Her refractive error and visual acuity were as follows:

Findings under cycloplegia: R.E. -14.00D. sph.  $\approx$  -4.00D. cyl. ax. 35°; L.E. -7.00D. sph.  $\approx$  -3.00D. cyl. ax.

175°. Corrected visual acuity: R.E. Counts fingers at one foot; L.E. 20/40+2; Both eyes, 20/20.

Even with both eyes open, a fine horizontal nystagmus to the left was occasionally observed. This became greatly exaggerated on covering the right eye. The afterimage test disclosed false projection in the right eye. As in the other instances, the nystagmus was not aggravated, nor was the visual acuity of the left eye lowered, by interposing a 10-mm. disc between the amblyopic eye and the fixation object.

*Comment.* In all these cases, the amblyopic eye, though itself possessed of a very low visual acuity, exerted a steadying influence on the other eye. This influence is probably a function of the peripheral retina, since it was not abolished by interposing a small opaque object between the amblyopic eye and the fixation point. Whereas in these cases only one eye was capable of central vision, the other supplying the steadying influence through its peripheral retina, in normal subjects these two functions are interchangeable and, in fact, do continually shift from eye to eye.

#### THE MECHANISM OF LATENT NYSTAGMUS

Since it is a known fact that fine nystagmoid movements are normal accompaniments of foveal fixation, latent nystagmus may be regarded as a quantitative, rather than a qualitative, deviation from the normal. It may thus represent a developmental defect of the motor phase of the sensorimotor mechanism involved in binocular vision.

The physiologic make-up of the central nervous system is such that the final common path is controlled by a series of functional levels. These levels are integrated among themselves in such a way that the higher levels of innervation exert an inhibitory influence on the lower

levels. The best-known example of the uninhibited action of the lower centers is the decerebrate state. Here one finds a redistribution of the tonus according to a definite pattern. Among other features, the movements of muscle groups are characteristically clonic in nature. One of the functions of the cerebral centers is to throw the impulses generated by the lower centers out of phase, so as to make possible a smoother action of the musculature.

The extraocular muscular apparatus, similarly, requires this cortical control in order to make possible a steady and continuous fixation, which is a prerequisite of good visual acuity. Binocular fixation brings the cortex into play to a higher degree than would be possible were either eye to be used alone. It thus appears plausible that binocular participation in the visual act plays a role in inhibiting the nystagmus in certain cases. This inhibitory action may be complete or only partial. In the latter case the nystagmus diminishes in amplitude while increasing in frequency. This may be owing to the fact that the impulses transmitted to the individual muscle fibers are thrown out of phase instead of being summated into coarse movements. In proportion to the reduction of the amplitude of the nystagmus one also notes an increase in the visual acuity. The curious fact noted in these cases of latent nystagmus is that the most rudimentary type of binocular vision and a truly insignificant degree of visual acuity in one of the eyes are sufficient to inhibit the nystagmus.

In a previous communication the

writer<sup>4</sup> has called attention to an analogous, though reversed, situation which obtains in the noncomitant hyperphoria of amblyopic eyes. In these cases the visual and fixational processes of the good eye affect the position of the amblyopic eye. For instance, covering the good eye results in a downward movement of the amblyopic eye. In latent nystagmus, on the other hand, covering the amblyopic eye brings on, or increases, the nystagmus of the good eye.

#### OCULAR DOMINANCE EXPLAINED BY "REPLACEMENT" THEORY

The observations made in these and other similar cases when viewed in the light of Verhoeff's replacement theory, permit some deductions to be made with regard to the concept of ocular dominance.

While one eye fixates, the other eye supplies the spatial setting for this act. One may think of the fixating eye as analogous to the foreground action on a stage, while the other eye represents the general setting of the scene. In other words, one eye supplies foveal vision, while the other supplies the peripheral field. If both eyes are equivalent as regards visual acuity, these two functions are interchangeable, and the eyes assume alternately the role of fixation. But even so, one eye fixates for a greater proportion of the time than the other. This eye is the dominant eye. Since most of the conventional tests for dominance are sighting tests, their function is really to determine which eye prefers to fixate, or which eye sees the more real image when physiologic diplopia is induced.\* Ocular

\* A very simple test for dominance which, in the author's experience, has proved fully as reliable as the more elaborate procedures, consists in having the patient raise his finger and, with both eyes open, sight one of the examiner's eyes. If the examiner then shuts his other eye momentarily, he can tell immediately which of the patient's eyes is covered by the finger. This is the dominant eye.

The determination of the dominant eye has a certain practical value in a routine refraction.

dominance, thus, does not refer to the vision as a whole, but merely to the act of fixation, which constitutes the motor response to sensory stimuli. Regarded from this point of view, the relationship between eyedness and handedness can be more easily understood.

#### SUMMARY

1. Three cases of latent nystagmus with amblyopia of one eye are presented.

2. The nystagmus may be interpreted as a modification of normal fixation-

movements.

3. The nystagmus is inhibited by a minimal amount of binocular vision, which apparently brings into play a higher degree of cortical control than does monocular vision.

4. Observations made on these cases confirm the validity of Verhoeff's "replacement" theory of binocular vision.

5. The "replacement" theory also serves to explain the phenomenon of ocular dominance.

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It is always advisable to guard against overcorrecting the nondominant eye, even if by so doing the visual acuity can be brought up slightly. The patient prefers to wear a correction which favors his dominant eye, so that a normal relationship between his eyes is maintained.

# NOTES, CASES, INSTRUMENTS

## AN AID IN USING THE PRISM COVER TEST IN THE CARDINAL DIRECTIONS OF GAZE

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The prism cover test has become generally accepted in most clinics in the United States for measuring ocular deviations in the various directions of gaze in patients with normal fixation with each eye. There has been, however, little or no attempt to standardize the actual angle of deviation of gaze at which these measurements should be determined. Especially in comparing the angle of deviation before and after surgical treatment of ocular-muscle pareses is it important that the measurements be made at the same position of gaze.

One of the commonest methods used to determine the deviation in the various directions of gaze is to have the patient tip his head obliquely while fixating a distant or near point. This is not only a crude measurement but, as Adler<sup>1</sup> has pointed out, is erroneous in that one

source of muscle tone, that due to the fusional impulses from the labyrinth and neck, is removed. The measurements should therefore be made with the subject's head erect and the eyes turned in the desired direction of gaze. Two questions then arise, first the angle of



Fig. 2 (Sugar). Frame in place. Arrows point to 20-degree markers. Numerals 1 and 2 indicate the centers for each eye.

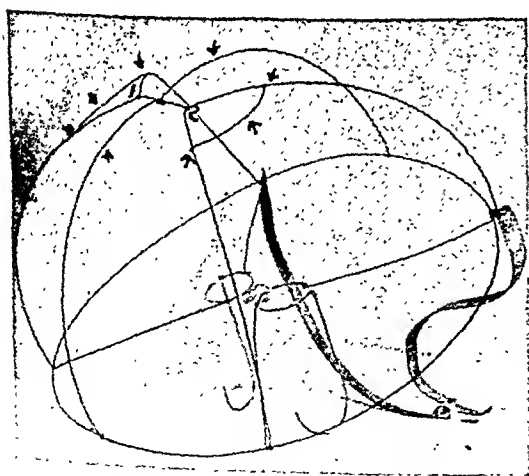


Fig. 1 (Sugar). Frame used to measure 20-degree angle of deviation of gaze. Arrows point to 20-degree markers. Numerals 1 and 2 indicate the centers for each eye.

deviation of gaze at which the measurements should be made, and, second, the actual method of measurement. The first question has been answered by Friedenwald<sup>2</sup> and, in my experience, is correct. Friedenwald's tests in a study of anisophoria indicated that 20 degrees off axis is the maximum deviation which it is convenient to use. This represents the limit of the field of ocular rotation ordinarily used in moving the eyes without moving the head. Beyond 20 degrees the fixation may become unsteady. Friedenwald also points out that 20 degrees is roughly the angular difference in position of the eyes for vision at distance and for reading.

The apparatus shown\* in figures 1 and 2 was devised as a simple means of indicating the 20-degree angle in the cardinal directions of gaze. It is made of 0.045-inch piano wire soldered to a spectacle frame. A leather strap is attached so that the centers can be adjusted to the level of the pupils. This apparatus is very light in weight and permits the examiner to place prisms before one eye with one hand and alternately to cover the eyes with an occluder held in the other hand. The distance from the spectacle frame to the measuring points is 8 inches, a convenient, arbitrary distance chosen so that the apparatus would not be too bulky but yet permit the examiner to insert his hands through the openings at the

sides. The diameter of the rim attached to the spectacle frame is 16 inches. The distance between the two centers is 62 mm., taken as the average interpupillary distance for near.

In using the apparatus, the angle is measured from the center point on the side of the abducted eye. The device may be used for either distance or near fixation, although I regularly measure the deviation in the cardinal directions of gaze for near only. The patient is asked to look past the 20-degree marker on the frame at the point of fixation while the examiner inserts the prisms and occluder to perform the cover test. The examiner keeps the fixation point in line with the marker and the visual line of the abducted eye during the performance of the test.

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\* Available at Belgard-Spero, Inc., 30 North Michigan Avenue, Chicago, Illinois.

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#### OPHTHALMOLOGY IN BRAZIL\*

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Brazil has 11 medical schools, each one of which teaches undergraduate ophthalmology. In each Department of Ophthalmology there are a professor, several associate professors, and several assistant instructors. No reference will be made here to the general medical curriculum. The lectures of ophthalmology for undergraduate students are given in either the fifth or the sixth year, the course varying from 6 to 12 months. Three lectures a week of one hour each followed by two hours of practical work are given, and at the termination of the course an oral,

written, and practical examination is made. The amount of material covered varies from a complete course in ophthalmology to various lectures pertaining to the diseases of the eye as related to general medicine. The main purpose of this undergraduate course is to prepare the student to recognize and treat the common diseases of the eye and understand the intimate relationship between ocular disease and general systemic disturbances.

There is generally close collaboration between the Department of Ophthalmology and the Department of General Medicine, so that consultation may be obtained when desired.

Postgraduate interneship in ophthalmology is available in the various medical schools, and the usual period of service

\* Because of transportation difficulties no corrected proof from the author was obtained.

varies from one to two years. If for any reason the student cannot carry out such a program of one to two years' additional study after graduation, he may, if he chooses, during his last one to two years of medical-school work, take additional instruction in ophthalmology in conjunction with his medical training, so that upon graduation he may be able to practice this specialty.

In addition, various special courses in ophthalmology are given every year in São Paulo and in Rio de Janeiro, available to ophthalmologists and general physicians who wish to become ophthalmologists. In São Paulo these courses have been regularly held by the Escola Paulista de Medicina and occasionally by the Faculdade de Medicina. They last one month and are intensive. The course is divided into two parts—the first part for beginners in the essential elements of ophthalmology and the second, more advanced, part for those who are practicing the specialty. The latter deals with the modern trends in ophthalmology. Various courses in any branch of ophthalmology are available the year round in São Paulo at the Escola Paulista de Medicina.

There are approximately 600 ophthalmologists in Brazil, but they are unequally distributed throughout the country. The greater number are located in Rio de Janeiro, São Paulo, Porto Alegre, Bello Horizonte, Bahia, and Recife. The ophthalmologists in the interior are not limited usually to ophthalmology but practice otorhinolaryngology as well. The main centers of ophthalmology in Brazil are at São Paulo, Rio de Janeiro, Porto Alegre, Bello Horizonte, and Bahia. Among the tropical diseases that are more frequently observed are cysticercosis, myiasis, blastomycosis, and other parasitoses. Cysticerci have been more frequently observed in the vitreous in the subretinal space, whereas myiasis are

observed in the lids and conjunctiva. In the cases of intraocular and external diseases due consideration is generally given to intestinal parasitoses, an etiologic factor. The other ocular diseases are observed more or less frequently. Their etiology is syphilis, focal infections, and tuberculosis, the treatment for which follows the well-accepted therapeutic methods.

Regarding ocular surgery, various procedures are employed, depending on the individual surgeon. When surgery is indicated for the lacrimal ducts the common procedure is dacryocystectomy and very rarely dacryocystorhinostomy. The underlying reason for this procedure may be explained on the following basis: In the latitude where we live, there is practically no winter. The temperature is even at all times. The average minimum is about 56°F. and occurs in June. Epiphora is practically minimal. In cataract surgery the conjunctival suture is the favorite. Extracapsular extraction is far more frequently used than intracapsular. As to whether the section is done with the Graefe knife or keratome depends on the choice of the surgeon. In glaucoma surgery iridencleisis is rarely practiced.

Refractions are done exclusively by ophthalmologists. We do not have optometrists in our country, for the law does not permit the optometrist to prescribe glasses and does not permit any relationship between the ophthalmologist and the optician for dispensing the glasses.

Among the ocular infections the most common are trachoma and ophthalmia neonatorum. Trachoma constitutes a sanitary problem. It is more prevalent among the people that have immigrated from Spain, Portugal, Italy, and Syria, and is more or less endemic. The type of trachoma prevalent is relatively benign, very rarely resulting in blindness if treated correctly. Ophthalmia neonata-

torum is, unfortunately, found relatively frequently in spite of the mandatory use of the Credé method. Acute catarrhal conjunctivitis is an epidemic in certain regions where it is often confused with trachoma. We have not observed epidemic keratoconjunctivitis in Brazil.

Modern equipment is used in the principal clinics and offices.

An intense campaign by the ophthalmologists and ophthalmologic societies of Brazil has been instituted for the prevention of blindness. The principal causes of blindness are trachoma, ophthalmia neonatorum, syphilis, and glaucoma. A social center for the prevention and treatment of glaucoma and infectious diseases is functioning at the Department of Ophthalmology of the Escola Paulista de Medicina, in São Paulo. The National Society for the Prevention of Blindness in Brazil, also has regional offices which constantly carry on a rigid campaign with the foregoing aims in mind. Brazil has several schools for the blind where they learn various occupations and at the same time read the classic Braille. There are also schools for the amblyopic.

All the Brazilian ophthalmologists are members of the ophthalmologic societies. There are eight ophthalmologic societies in Brazil, one in each of the following cities: Rio de Janeiro (Sociedade Brasileira de Ophthalmologia), São Paulo (Centro de Estudos de Ophthalmologia and Sociedade de Ophthalmologia de São Paulo), Campinas, São Paulo State (Associacao Medica do Instituto Penido Burnier), Porto Alegre (Sociedade Riograndense de Ophthalmologia), Bahia (Sociedade Bahiana de Ophthalmologia), Recife (Sociedade Pernambucana de Ophthalmologia), and Belem (Sociedade Paraense de Ophthalmologia). All the societies meet regularly for the presentation and discussion of papers; these are published in special

journals. The official organ of the Pan American Congress of Ophthalmology is published in São Paulo (Ophthalmologia Ibera Americana). The Brazilian Congress of Ophthalmology and Argentine Congress meet every two years. Three outstanding reports on previously chosen subjects are presented by Latin American ophthalmologists at these meetings. When the meeting is held in Brazil, two of the scientific papers are presented by Brazilian ophthalmologists and one by an Argentine. When the Congress is held in the Argentine, the process is reversed. The coöperation between the two countries is excellent.

At the last Brazilian Congress of Ophthalmology, which was held in Rio de Janeiro in 1941, Dr. Harry S. Gradle of Chicago rendered an outstanding service to Brazilian ophthalmology by supporting our project of establishing a Brazilian Board of Ophthalmology. This, we hope, will raise the standard of our specialty as the American Board has done in the United States. For his most generous aid, all our men in this field express their deepest gratitude.

1151, *Consolação*.

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### CHRONIC CONJUNCTIVITIS CAUSED BY CYSTOID DE- GENERATION OF THE UPPER CANALICULUS\*

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In cases of chronic conjunctivitis that resist treatment, the usual procedure is to test the drainage apparatus, either by instilling a colored solution into the conjunctival sac and trying to recover it from the nasal secretions, or by syringing the lacrimal sac through the lower canalicu-

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\* Read before the Chicago Ophthalmological Society, May 15, 1944.

lus. If the sac is found to be patent, local lid therapy is resumed in the hope of eventually obtaining a cure. If an obstruction is found, recourse is had to surgical treatment. Usually the upper canaliculus is ignored and because of this omission the cause of the trouble in the case to be reported was not found as early as it might otherwise have been. The patient had been treated by two reputable ophthalmologists and members of a well-known clinic in this city, but without eliciting the etiology. After each session of treatments, the conjunctivitis materially improved and the patient was discharged as cured or, as in one instance, she gave up after six months because of the long-drawn-out course of treatments. The distinct advantage in being the fourth ophthalmologist to see the case is obvious.

The literature is unanimous in stating that obstruction of the canaliculi is caused by fungus infection.

Duke-Elder under the heading of "Lacrymal conjunctivitis," gave the best textbook description of this condition as follows:

This term is sometimes applied to a chronic conjunctivitis caused by obstruction and infection of the lacrymal passages. The organisms therefrom, usually streptococci or pneumococci, continually infect the conjunctival sac, keeping up the symptoms of a chronic inflammation of the mucous membrane and the lid margins. . . . The condition is worthy of note from the clinical point of view in that its cause—a streptothrix in the canaliculus, for example—is frequently missed, with the result that a chronic conjunctivitis goes on indefinitely in spite of treatment. . . .

In adding case reports to the literature many authors, one after the other, stated that the condition is rather uncommon; but if one sums them up the total is rather formidable for so rare a condition. One is impressed, in checking over the available literature for the past 40 years, by the paucity of data on this subject prior to

1921, but between that time and 1940, 21 cases were reported. Undoubtedly others have occurred that have not been recorded.

The most comprehensive report on the subject was made by Elliott\* who presented data on nine cases that were seen at the New York Eye and Ear Infirmary in two years. Streptothricosis was given as the cause of all of them. He divided his cases into two groups: (1) those with canalicular signs predominating, and (2) those with marked conjunctival reactions without apparent canalicular signs. Duration of symptoms was one month to three years. Five of his patients had lower-canalculus involvement, 2 had upper-canalculus involvement, and 2 had infection in both; 4 had very slight swelling around the punctum, 2 had marked swelling around the punctum, and 3 had no external signs.

#### CASE REPORT

Miss B. M., aged 48 years, presented herself a few weeks ago complaining of almost constant "infection" of the right eye for the past 18 months, during which time she had been treated by two ophthalmologists, also at a recognized eye clinic. Under treatment, the eye became almost well but she noticed a little pus in the corner every day even when it was at its best. When treatment was stopped, the eye soon became inflamed again.

*Examination.* Visual acuity right eye, 20/20+; left eye, 20/25+. The lids of the right eye were brawny in appearance and slightly edematous. Considerable pus secretion was present in the conjunctival sac; the conjunctiva of the lids and fornices was very red and thickened; the bulbar conjunctiva was only slightly injected. Cultures and smears were reported

\* Elliott, A. J. Streptothricosis of lacrimal canaliculi: 9 cases. *Amer. Jour. Ophth.*, 1941, v. 24, June, pp. 682-686.



to contain *Staphylococcus albus* and pure diphtheroids. The left eye appeared normal in all respects.

*Treatment.* Silver nitrate 2 percent was applied to the conjunctiva every second day. The patient was given argyrol 20 percent to be instilled in the eye three times a day and zinc sulfathiazol ointment 5 percent to be put into the eye at



Fig. 1 (Leech). X-ray picture showing boundaries of cyst in case of degeneration of the upper canaliculus.

bedtime. At the end of a week the eye was much improved. Office applications were changed to zinc sulphate solution 2 percent every second day for the next 12 days. At the end of this period the conjunctiva was almost normal in appearance, but a little pus was still present in the inner canthus every day. The tear sac was therefore investigated by syringing through the lower canaliculus. To my surprise the fluid passed freely into the nose and no pus whatever was returned. At the patient's next visit, upon everting the upper lid, I observed a tiny bead of pus exuding from the upper punctum, which gave the cue to investigate the upper canaliculus. After the punctum was dilated a lacrimal needle was inserted. Instead of meeting the usual resistance from a normal canaliculus, the needle could be moved around in all directions under the skin. With the needle as a probe, a flat cavity, measuring approximately 5 mm. vertically by 7 mm. horizontally and collapsed antero-posteriorly,

was made out. No pathologic changes could be found on palpation. When fluid was forced through, considerable pus flowed back along the needle but no fluid entered the lacrimal sac. Iodized oil was then instilled to mark the boundaries of the cyst and X-ray pictures were taken.

Later a small cataract knife was inserted through the upper punctum into the cavity and the lid was incised as is done in slitting a canaliculus. Two typical greenish, waxlike concretions, one 2 mm. in diameter and the other slightly smaller, were removed with a curette along with some pus and other debris. The lining of the sac was cauterized with trichloroacetic acid, and the eye bandaged for 24 hours. Healing was uneventful, and within one week there was no accumulation of pus in the conjunctival sac. The patient was comfortable and happy.

#### DEDUCTIONS FROM THE LITERATURE AND FROM MY CASE REPORT

1. Fungus infection and obstruction of the canaliculi would seem to be common enough to cause embarrassment to the ophthalmologists who find that they have missed the diagnosis. Many patients have suffered from annoying conjunctivitis for months, even years, before diagnosis was made (one patient suffered eight years).
2. Chronic intractable conjunctivitis is the dominant symptom of a blocked canaliculus.
3. The condition is usually unilateral but the possibility of both eyes being involved should not be overlooked.
4. It is more common in women than in men.
5. External diagnostic signs, such as swelling over the canaliculus, turgescence of the papilla, or marked epiphora, may not be present.
6. Routine bacteriologic examination may not help in the diagnosis of cases of long standing.

7. In some instances fluid from a syringe can be passed through the involved canaliculus to the nose. In such cases diagnosis is more difficult unless pus is carefully watched for in the return flow.

8. Upper-canaliculus involvement is easier to overlook than lower, for the patency of the drainage apparatus is usually tested by syringing through the lower canaliculus.

55 East Washington Street (2).

### TRIAL FRAME FOR YOUNG CHILDREN

WALTER H. FINK, M.D.

*Minneapolis, Minnesota*

The problem of refracting the very young child is made more difficult by the lack of an adequate frame. The adult trial frame may be used for children who are three years of age and older, but it is entirely inadequate for the child who is less than three years of age. Because we are frequently called upon to refract these younger children, and in some instances they are as young as one year, it is evident that a frame to satisfy this need should be available. A survey of the trial frames in present-day use reveals the fact that there is nothing that may be considered satisfactory.

To meet the need, a frame has been designed, molded from plastic material. The bows are straight and the nose piece is built so that the frame will not touch the lashes. There are no sharp edges that might cut the tissues. The interpupillary distance is 55 mm., which may be considered the average for a two-year-old child. A +3.50D. sphere with a metal rim is inserted into a channel in the plastic material and is so constructed that it can be removed readily if desired. This strength of sphere is used because

many children of this age have a lens requirement of 2.50D. of hyperopia. The additional 1.00D. is added so that the retinoscopic test can be done at a distance of 1 meter, thus eliminating the necessity of adding a compensatory sphere.

Two clips are placed before each lens so that a cylinder may be inserted in one

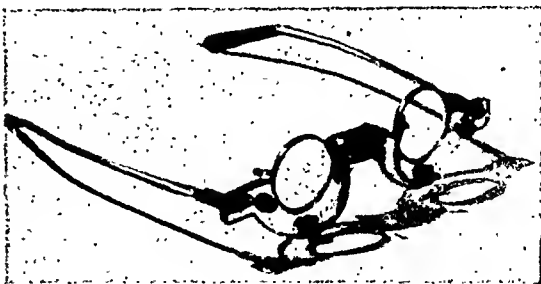


Fig. 1

and a sphere (plus or minus) or an occluder may be added to the other.

The frame can be used on an apprehensive child by whom another frame might not be tolerated. Because of its light weight, good balance, and no points of pressure, it is not annoying to the child. It can be applied and removed easily. The time necessary for the test is greatly reduced, which is an advantage in dealing with a young child. This reduction in time is made possible by the +3.50D. lens that is in the frame, because the examiners can frequently at a glance estimate the lens requirement; or, if this is not possible, the number of lens changes is greatly reduced.

Before applying the frame, the child's attention is concentrated on a mechanical toy held by the examiner. While thus occupied, the examiner slips the frame on the child and quickly estimates the correction by retinoscopy. The frame can be quickly removed and a lens added which will correct the astigmatism, or increase or decrease the spherical correction as the case may be. The process can be repeated several times in a few moments. Fre-

quently the child is not conscious of what is going on, he is so intent on watching the mechanical toy.

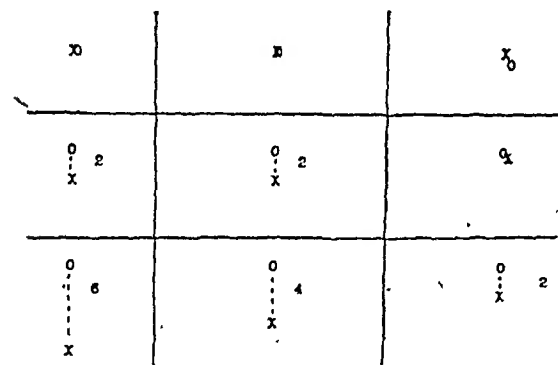
The writer has used the frame for over 10 years and has found it invaluable.

1029 Medical Arts Building.

## REFRACTION CLINIC\*

DISCUSSION BY ALBERT E. SLOANE, M.D.<sup>†</sup>  
Boston

A shoe worker, aged 52 years, noted during the past month that he had some mild vertigo which was exaggerated when reading or working at his machine. Believing this to be related to his eyes, since he had not changed his glasses for over five years, he went to an eye doctor. This person explained his symptoms on a basis



X = O.D., O = O.S. Plotted in arc degrees.

of need for bifocals, which he subsequently prescribed. The bifocals produced more symptoms, much more severe than he had had before the glasses were worn. He was labeled as a neurotic and was told it was simply a matter of "getting used to double-vision glasses."

## EXAMINATION

His vision was O.U. 20/40, correctable

\* From the House Officers' Teaching Clinic, Massachusetts Eye and Ear Infirmary.

<sup>†</sup> Director of Department of Refraction.

to 20/20, each eye, with: R.E. +1.25D. sph.  $\approx$  -0.25D. cyl. ax. 90°; L.E. +1.25D. sph; add +2.00D. sph. Wells #1 Type.

The patient had a 3<sup>A</sup> esophoria and a 3<sup>A</sup> right hyperphoria in the primary position. His old glasses measured: First pair (obtained over five years ago) +2.00D. sph., O.U., in single-vision lenses. The recent pair of bifocals measured +1.25D. sph., O.U., with +2.00D. sph. add. He volunteered that he could see better at near with his bifocals than with his old reading glasses, but was most uncomfortable and would become confused. In view of the sizable amount of hyperphoria a diplopia field was executed, and this revealed a paresis of the right superior oblique muscle. The quantitative diplopia readings in the depressor field varied from 12<sup>A</sup> (6 arc degrees) to 4<sup>A</sup> (2 arc degrees) right hyperphoria.

## DISCUSSION

Obviously this patient's difficulties cannot be explained on a basis of his refractive error, *per se*. However, it is easy to explain the symptoms on a basis of his anisophoria. Since the heterotropia is within such small limits in straight-ahead and elevated fields, he has not been troubled by frank diplopia and probably kept his head sufficiently cocked so as to utilize his depressor fields (which were the highest handicapped) at a minimum. When bifocals were prescribed for him he had to use his depressor muscles in order to look through the segments, and since his depressor field had the most diplopia, the result was increased discomfort.

## SOLUTION

In such cases where diplopia is not particularly disturbing, it is frequently not necessary to occlude one eye. The patient,

however, is allowed to compensate for his diplopia by tilting his head so that the eyes will be in a more advantageous position. Thus any optical correction for focusing the eyes should not be of such a nature as to hinder the person from holding his head and the direction of his eyes as serves him best. In this case bifocals are absolutely contraindicated and the patient is best served through prescribing single-vision glasses for distance and near. It so happened that this patient had a positive blood test and his paresis was explained on this basis.

### QUESTIONS

House Officer: Could bifocals have been made with the reading segment above?

Dr. Sloane: In this case such a bifocal might have been acceptable since the reading portion would be located in the field of elevation where the diplopia was not a factor. However, as a general rule, bifocals are not satisfactory in cases of paresis of an extraocular muscle because there is frequent need for tipping the head to one side, which makes the person look through a different portion of each segment.

H.O.: What prompted you to execute a diplopia field in the absence of history of double vision?

Dr. Sloane: Any case in which there is a sizable amount of hyperphoria requires additional tests to classify the nature of the hyperphoria.

H.O.: What are these additional tests for classifying hyperphoria?

Dr. Sloane: First, a diplopia field to determine the presence of a paresis or overaction of a vertical muscle. Second, repeating the test with the fusion deceiving device (Maddox rod) before either eye to rule out the presence of an alternating hypertropia.

243 Charles Street (14).

## CHART FOR RECORDING LOCATION OF CORNEAL INJURIES AND LESIONS\*

FRANK H. RODIN, M.D.

*San Francisco*

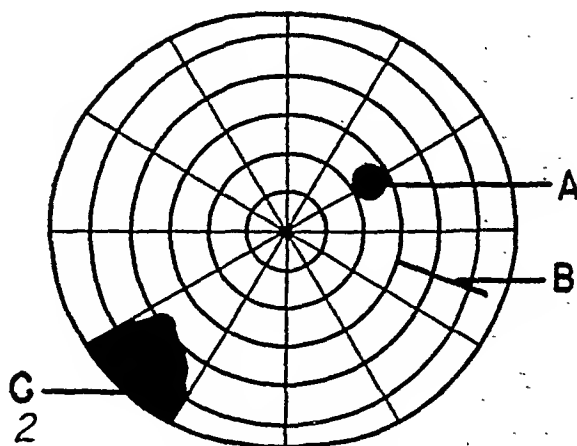
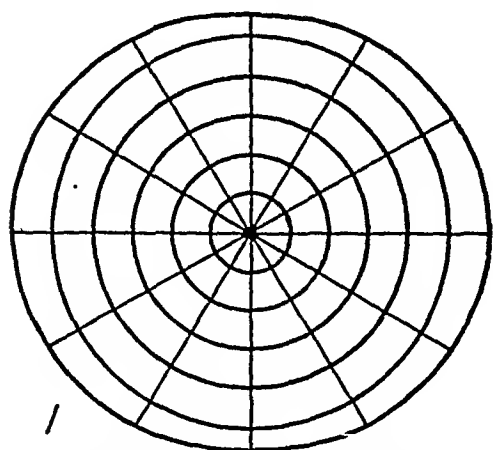
The necessity for a chart showing the exact location of injuries and lesions to the cornea is obvious. We have been unable to find one in the ophthalmologic literature. Such a chart is especially desirable in view of the tremendous growth of industry in recent years with a corresponding increase in ocular injuries. The commonest of these is trauma produced by a foreign body imbedded in the cornea. Foreign bodies are removed not only by ophthalmologists but by industrial surgeons, general practitioners, and, at times, by a nurse at a first-aid station. In the majority of cases, the record supplied fails to specify the precise location of the injury. This is of great importance, particularly when a claim is later made for loss of vision due to an injury to the cornea and examination shows more than one scar. A simple chart is also advisable to record quickly and accurately any corneal lesion that may present itself for treatment, such as a corneal ulcer. The progress of the condition, whether advancing or healing, can be accurately set forth on such a chart.

A simple chart for permanent recording of the exact location of corneal injuries and lesions is described. According to Fuchs,<sup>1</sup> the horizontal diameter of the cornea is 12 mm., and the vertical 11 mm. This chart (fig. 1) consists of five equidistant concentric circles and an ellipse. The distance between the circles represents 1 mm. The distance between the fifth circle and the periphery of the chart, the ellipse, represents 1 mm. in the

\*From the Department of Ophthalmology, Mount Zion Hospital, San Francisco. This research was aided by a grant from the Columbia Foundation.

horizontal direction and 0.5 mm. in the vertical direction. Thus, in the horizontal direction there are six arcs on either side of the center, each representing 1 mm. distance from center to perimeter. In the

position. For example (fig. 2), A would indicate a foreign body 1 mm. in size, 2 mm. from the center in the direction of the 2-o'clock position. B would indicate a corneal abrasion 2.5 mm. long, starting



Figs. 1 and 2 (Rodin). Corneal chart.

Fig. 1. Chart for recording location of corneal lesions; it consists of five equidistant concentric circles and an ellipse. The distance between the circles represents 1 mm. The distance between the fifth circle and the periphery of the chart, the ellipse, represents 1 mm. in the horizontal direction and 0.5 mm. in the vertical direction. Thus, in the horizontal direction there are six arcs on either side of the center, each representing 1 mm. distance from center to periphery. In the vertical direction, the first 5 arcs represent 1 mm. distance from center to fifth arc, and 0.5 mm. from fifth to sixth arc. Twelve straight lines radiate from center to periphery of the chart 15 degrees apart, resembling the face of a clock.

Fig. 2. Method of marking corneal lesions on chart. The site is defined in terms of distance either from the center of the cornea or from the limbus, and the time o'clock position. For example, A would indicate a foreign body 1 mm. in size, 2 mm. from the center in the direction of the 2-o'clock position. B would indicate a corneal abrasion 2.5 mm. long, starting at 0.5 mm. from the limbus between the 3- and 4-o'clock positions. C would indicate a corneal ulcer at the limbus between the 7- and 8-o'clock positions, and extending for 2 mm.

vertical direction, the first 5 arcs represent 1 mm. distance from center to fifth arc, and 0.5 mm. from fifth to sixth arc. Twelve straight lines radiate from center to periphery of the chart, 15 degrees apart, resembling the face of a clock.

The classical landmarks are the center of the cornea and the limbus. The central point on the chart represents the center of the cornea, and the periphery represents the limbus. In describing a corneal lesion, the site is defined in terms of distance either from the center of the cornea or from the limbus, and the time o'clock

at 0.5 mm. from the limbus between the 3- and 4-o'clock positions. C would indicate a corneal ulcer at the limbus between the 7- and 8-o'clock positions, extending for 2 mm.

I use a rubber stamp made from an engraved wood cut 24 by 23 mm. in diameter, which is actually twice the size of the cornea. The patient's record is stamped, and a sketch of the corneal lesion is drawn on the chart. This is a permanent record, which can easily be translated in descriptive terms for a report.

490 Post Street.

#### REFERENCE

- <sup>1</sup>Fuchs, Ernst. Textbook of ophthalmology. Ed. 2, Philadelphia, J. B. Lippincott Company, 1923, p. 17.

## MOTILITY CLINIC\*

## SUDDEN ONSET OF CONCOMITANT

## CONVERGENT STRABISMUS

HERMANN M. BURIAN, M.D.

*Hanover, New Hampshire*

D. E. S., a boy aged 15 years, had a convergent strabismus of the right eye.

The history given was as follows: No case of strabismus, amblyopia, nor high refractive error was known to have occurred on either the paternal or maternal side of the patient's family. Aside from frequent colds and measles in early childhood, the patient had never been ill. One morning, three years ago, the mother suddenly noticed that the patient's right eye was turned in and the patient himself noticed diplopia. The eye straightened out in the course of the day, but it was again turned in the next morning and has remained in convergent position ever since. No fever, malaise, nor any disease preceded the turning of the eye. The left eye never turned unless the patient made a conscious effort to use the right one. The patient has permanent spontaneous diplopia which was at first most disturbing; he has now become adjusted to it. He was given glasses after the onset of the strabismus but they were discarded a year and a half ago with the consent of the patient's physician, since they had in no way influenced the strabismus or the diplopia.

The patient's report arouses the suspicion that he sustained a paralysis of the right external rectus muscle and that the convergent strabismus which he now displays is a sequel to this paralysis.

## DIAGNOSIS

Uncorrected visual acuity was

20/15—2 in either eye. Refraction: R.E. +1.25D. sph. = 20/15. L.E. +1.25D. sph.  $\oslash$  —.25D. cyl. ax.  $180^\circ$  = 20/15.

*Rotations.* In levoversion there was a marked excess of adduction of the right eye; the abduction of the left eye was normal. In dextroversion there was an excessive adduction of the left eye, about as pronounced as in the right eye, but the *abduction of the right eye was normal*. The assumption that in this case the strabismus was of parietic origin is thus not borne out. The referring doctor who has followed the patient since the very onset of the strabismus also stated that he had never been able to discover a deficiency of abduction of either eye. The rotations up, down, up and right, and down and right were normal, but a slight lagging of the right eye was noticeable when the patient looked up and left and an excessive movement of that eye when he looked down and left. There was, in other words, a slight weakness of the right inferior oblique, accompanied by an overaction of the right superior oblique.

*Cover test.* The patient fixated with the left eye, but when that eye was covered he was able to assume and keep up fixation with the right eye. He could also voluntarily switch fixation from one eye to the other. The angle of squint appeared to be the same, whether he fixated with the right or left eye. Aside from the horizontal movement no other movements were seen in the cover test. The horizontal movement of the eyes was offset with prisms of  $30^\Delta$ , base out, in front of each eye. The movement stopped for both eyes with the same prism strength; in other words, the primary and secondary angles of squint were equal.

*Double-image test.* The patient had permanent spontaneous diplopia and the relative localization of the two spontaneously seen images had first to be investigated. The patient reported that he saw

\* From the Clinical Division of the Dartmouth Eye Institute, Dartmouth Medical School. The cases described were demonstrated at a Staff Meeting of the Dartmouth Eye Institute.

the fixation light of the tangent screen double; one image was in the center, the other image to the right, a considerable distance from the central light, even beyond the screen. When the right eye was covered, the image to the right disappeared: the patient had an uncrossed diplopia. A dark-red filter was placed in front of his right eye. The left eye fixated the center light and the patient saw the red light to the right at a distance of about 30 arc degrees from the fixation light. The red filter was then placed in front of the left eye. The right eye fixated and the red light appeared to the left, again at about 30 arc degrees from the center. Since the second image was beyond the screen the distance of the two images could be determined only approximately. When the patient's angle of squint was reduced by one half by placing prisms of  $15^{\Delta}$  base out in front of each eye a distance of 15 arc degrees between the two images was found. There was no vertical deviation of the double images. The patient, then, showed *normal retinal correspondence in the double-image test*.

Prisms of  $30^{\Delta}$ , base out, were placed in front of each eye, thus compensating the entire angle of squint. The patient no longer saw the fixation light double; and when the red filter was now put in front of either eye, the red and white lights coincided.

*Afterimage test.* The patient first fixated for 10 seconds the center of the glowing filament of the tubular bulb while it was in the horizontal position, keeping the right eye covered. Then he covered the left eye and with the right eye fixated for 10 seconds the center of the filament, which was now in the vertical position. The room was darkened and the patient reported immediately that the afterimages of the filament formed a cross. The same was true of the negative afterimages which he saw in the lighted room: in spite

of the convergent position of the eyes the afterimages formed a cross. The patient presented *normal retinal correspondence* in the afterimage test and the speed and definiteness with which he reported the position of the afterimages demonstrated that there was no suppression.

*Examination for binocular vision.* It was of importance for the therapy to examine in this case the coöperation of the two eyes. Surgical procedure would seem to be the only means by which the condition could be corrected. But there was the danger that the patient might have *horror fusionis* and that the diplopia would persist after the eyes were straightened. It would then be much more disturbing than before surgery, because the double images would be close together.

It was unlikely that this patient had *horror fusionis*. The patient saw single when the angle of squint was compensated by prisms. This never occurs in cases of *horror fusionis*. Examination with the synoptophore confirmed the impression that the patient had no *horror fusionis* but a rather highly developed binocular coöperation. The following condition was found: The objective angle of squint, as measured with first-degree targets, was  $62^{\Delta}$ . There was a varying, small right hyperphoria of 0 to  $1^{\Delta}$ . Subjectively the patient superimposed the first-degree targets at  $62^{\Delta}$  of convergence. The same angle was found with second-degree targets, and there were fusional amplitudes of from  $20^{\Delta}$  of convergence to  $4^{\Delta}$  of divergence. The third-degree targets were easily fused at the objective angle, but it was doubtful whether the patient had stereopsis; in any case it was only rudimentary.

#### THERAPY

The question of therapy arises. The strabismus is disfiguring and the diplopia disturbing; the patient is eager to have

both handicaps removed.

Based on the results of the examination surgery is advocated. The patient stands an excellent chance for a good cosmetic and functional result.

The type of operation to be performed is determined by the rationale of operations on the extrinsic muscles of the eyes: they can change only the mechanical conditions; the choice of operation depends on the mechanical anomalies present in the case. The patient has a marked excess of adduction in both eyes; the abduction is normal. The action of the internal rectus muscles must, therefore, be weakened. A recession of the right internal rectus should be performed; then, after the result has been established, a recession of the left internal rectus. If there is still a residue of convergent strabismus after the adduction has been normalized, a resection or advancement of the right external rectus—or possibly of both external rectus muscles—should follow.

#### DISCUSSION

The patient has a low, isometropic refractive error. He has for no apparent reason acquired acutely a marked convergent strabismus with all the earmarks of concomitance. The left eye is habitually used for fixation; the adduction is excessive in both eyes; the abduction is normal. The patient has permanent spontaneous diplopia; the relative position and distance of the two images correspond to his angle of squint; the retinal correspondence is normal; there is no sign of suppression. When the angle of squint is compensated by prisms or in the synoptophore, there is no *horror fusionis*, but a rather high degree of binocular coöperation.

The diagnosis and the therapeutic course to be taken are clear. But two points remain unexplained. One is, why the patient whose visual acuity is normal

and equal in both eyes, and who is perfectly able to fixate with either eye, does not in any sense alternate and never spontaneously uses the right eye for fixation. The other question is why the strabismus has occurred at all in his case.

There is no known family history of strabismus; the ocular conditions do not predispose the patient for strabismus; no cause for the interruption of fusion could be found. While it is impossible to offer an explanation for the etiology of the strabismus in this case, similar observations can be quoted for comparison.

E. A. A., a boy 11 years of age, in good health, gave a negative ocular family history. Two months prior to the first examination the father had noticed that the boy's right eye turned in occasionally. The boy had never worn glasses; he had a low hyperopic refractive error and normal vision in each eye (R.E. = L.E. = +1.00D. sph.  $\approx$  +.50D. cyl. 90° = 20/20 under atropine). He showed an intermittent alternating convergent strabismus of 13 to 15 arc degrees with normal retinal correspondence and a slight excess of adduction in the right eye. There was no sign of any paralysis of the external ocular muscles. In the synoptophore the patient had normal binocular vision, although there was some suppression of the right eye. The refractive correction was given and the patient was not seen until a year later, at which time he reported that the strabismus had become much worse and that for the past three or four months the right eye had been turned in all the time. The angle of squint had indeed increased to 23 arc degrees; otherwise the condition was unchanged. A recession of the right internal rectus gave a good cosmetic and functional result.

S. S. M., a nun aged 25 years, reported



that she had noticed occasional diplopia and turning in of her eyes for four years previous to the first examination; for the past six months the strabismus and the diplopia had become permanent and the turning increased. The patient wore O.U.  $-0.75D.$  sph., but an atropine refraction revealed R.E. = L.E. =  $+1.50D.$  sph. = 20/20. There was no anomaly whatever in the rotations, but the patient had a very large angle of alternating convergent strabismus (approximately 30 arc degrees) with normal retinal correspondence. There was a great deal of suppression of the nonfixating eye. A bilateral resection with advancement of the external rectus muscles gave an excellent cosmetic and functional result.

Mrs. E. B. H., a woman aged 72 years, reported that 10 years prior to the examination she began seeing double during an attack of pneumonia and that the diplopia had persisted ever since. Both eyes were normal in every respect and had a visual acuity of 20/20 with a low plus sphere (R.E. = L.E. =  $+0.25D.$

sph.). The patient had an alternating convergent strabismus of 10 arc degrees with normal retinal correspondence and without any anomaly in the rotations. She had normal binocular vision and good fusional amplitudes in the synoptophore. A resection with advancement of the left external rectus gave an excellent cosmetic and functional result. The patient has had no diplopia since. Two years after the operation an esophoria of  $2^{\Delta}$  for distance and  $7-8^{\Delta}$  of exophoria for near were found.

The cases reported show that concomitant alternating convergent strabismus may occur more or less suddenly at any age. In none of these cases was there any sign of a paralysis of the external rectus muscles; all patients had a low refractive error and possessed undoubtedly full binocular vision prior to the onset of the strabismus. In only one did a disease that might account for its development precede the strabismus.

*4 Webster Avenue.*

# SOCIETY PROCEEDINGS

EDITED BY DONALD J. LYLE

## CHICAGO OPHTHALMOLOGICAL SOCIETY

December 20, 1943

DR. VERNON M. LEECH, *president*

### CLINICAL MEETING

(Presented by the Department of Ophthalmology, Loyola University Medical Society)

#### ACUTE OPTIC NEURITIS, O.D.

DR. PAUL CARELLI presented M. P., a white girl, aged 23 years, who complained on December 5, 1942, of sudden severe frontal pain and headache which was relieved with aspirin. Three days later, on arising, she noted marked diminution of vision in the right eye. Examination on December 10th showed the vision R.E. was reduced to ability to count fingers at 1 foot; L.E. 1.2-1.

The fundus of the right eye showed the optic nerve swollen, the margins blurred. There were no hemorrhages nor exudates. The vessels were apparently normal. There was no improvement with correction of refractive error. The visual fields showed a central scotoma with peripheral contraction. Physical and laboratory examinations showed nothing significant with the exception of enlarged and chronically injected tonsils and cloudy sinuses.

The patient remained in the hospital for 13 days, during which time she received daily intranasal shrinkage packs for the first week; 4 intravenous typhoid injections; 6 injections of 1-c.c. thiamin chloride; 4 injections of nitroscleran. There was slight reduction of the swelling of the nerve. One month after onset, with weekly injections of thiamin and

nitroscleran, the edema had subsided, the disc was slightly pale, and the vision was unchanged. Tonsillectomy was performed. In February, 1943, the vision was 0.4 and the nerve head was definitely pale.

In March, three months after onset, the vision of the left eye suddenly decreased to 0.5 with central scotoma and partial upperquadrant defect. The previous treatment was repeated, with gradual improvement in vision. In June, 1943, the disc of the right eye was definitely pale; the disc of the left eye was normal. The vision was R.E. 0.8-4; L.E. 1.2-3.

#### ACUTE OPTIC NEURITIS, O.D.

DR. PAUL CARELLI said that A. T., a white woman, aged 28 years, gave a history of sudden loss of vision in the right eye, following headache and pain on movement of the eyes. Examination two weeks after onset showed vision R.E. 5/200; L.E. 1.2-4. The fundus of the right eye showed swelling of the nerve head, and blurring of the margins. There were no hemorrhages nor exudates. The left eye was normal. The physical and laboratory examinations were essentially negative except for slight cloudiness of both ethmoid sinuses and enlarged turbinates.

The patient remained in the hospital 10 days under treatment with typhoid injections, nitroscleran, thiamin, and salicylates, and thereafter was kept under observation. Three months after onset the vision in the right eye was 1.0. The disc was definitely pale. Six months later, following cessation of therapy, the vision again dropped to 0.6. Weekly injections of thiamin and nitroscleran were re-

sumed and vision returned to normal within one month.

#### MIKULICZ'S SYNDROME: RIGHT FACIAL PARALYSIS

DR. ROY RISER (in presenting the following three cases for Dr. Carl Schaub) said that Sister A. C. was first seen in January, 1943. She gave a history of 4+ severe dryness and 4+ redness of the eyelids; 4+ parched burning and dry tongue and difficulty in swallowing which had been present since August, 1942. There was bilateral 4+ enlargement of the parotid, submaxillary, and sublingual glands, and the patient complained of extreme pain. The Schirmer test was practically negative. The lacrimal glands were palpable under the superior orbital rim. The patient was given large doses (45 to 60 drops) of potassium iodide daily; pilocarpine sweats; and an eye wash to be used frequently as a substitute for tears; vitamin B and cod-liver oil.

In May, 1943, a right facial paralysis occurred and she went to the general clinic where a complete neurologic examination was made. This paralysis was probably due to the swollen glands.

When last examined in November, 1943, the glands were hardly palpable, the general condition was much improved, and the Schirmer test now showed tears.

#### BILATERAL POSTINFLAMMATORY LESIONS

DR. ROY RISER said that E. W., a man, aged 30 years, was shown before this Society in January, 1943. The history was of an attack of inflammatory edema in the right eye in December, 1939, which resulted in a large central atrophic area. The vision was 20/70—1. A second attack occurred in the left eye in February, 1941. Two lesions were found in this eye, in the upper outer portion of the macula, and a smaller pinhead-sized lesion immediately intrafoveal. Vision of

the left eye was 20/12 with correction.

At that time the condition was thought to be on a focal inflammatory or vascular basis. The patient was given typhoid injections; old tuberculin; and peripheral vascular investigations were carried out. Therapy has been continued with thyroid, theominal, vitamin C, and multiple vitamins.

In August, 1943, the left eye had another acute attack followed by an intense gray ischemic edema of the entire macular area. The vision was reduced to 1/200 and gradually returned to 20/40. Again in December, 1943, the patient suffered deep hemorrhages which reduced the vision to 2/200, from which it is slowly recovering. It is felt that the condition is angiospastic in origin, and in addition to the previous treatment, an allergic investigation will be made.

#### BILATERAL PARALYSIS OF SPHINCTER PUPILLAE

DR. ROY RISER said that Mrs. L. C. B., aged 46 years, was refracted under paraldrine on November 26, 1943. Thirty-six hours later she complained of migraine headache with marked decrease in vision in both eyes. On November 29th, there was severe pain in the right eye and head and a deep cloudy area in the center of the cornea of the right eye. The pupils were dilated, irregular, and fixed. The tension was normal. The vision was R.E. 0.1; L.E. 0.82. The condition gradually improved and the vision at this time was R.E. 1/5—2; L.E. 1.0. Because the findings simulated those of glaucoma, eserine drops were prescribed and gynergen injections daily were advised.

#### MARFAN'S SYNDROME

DR. J. R. FITZGERALD presented a man, aged 28 years, who was seen for the first time in April, 1943. He had been rejected

by the Army and was told that his eyes were not properly corrected.

The patient was 73 inches tall, slender, and somewhat stooped, and weighed 130 pounds. There was marked elongation of the bones of the extremities, particularly the distal phalanges. A slight kyphosis was present in the thoracic region, with marked pigeon breast. His face was slender, with fairly prominent mandible. There was marked absence of subcutaneous fat. No visceral changes were found. Mental development had been normal. Family and past history were negative.

The essential ocular findings consisted of an iridodonesis with incomplete symmetrical ectopia lentis in each eye. The pupils measured 3 mm. in diameter, were equal, and reacted well to light and accommodation. Tonometric readings were within normal range. No peripheral field changes were found. The vision was R.E. 20/100, corrected to 20/50 and J.3; L.E. 20/30, corrected to 20/20 and J.1. There were 16 prism diopters of exophoria present for near. No unusual fundus changes were noted.

This patient presented a well-marked picture of arachnodactyly or Marfan's syndrome, with demonstration of most of the classical features.

#### ESSENTIAL BLEPHAROSPASM WITH SURGICAL CORRECTION

DR. J. R. FITZGERALD said that this woman, aged 73 years, when seen for the first time in October, 1943, complained of inability to open her eyes, associated with painful spasm of the eyelids. At first the lid spasms were infrequent but they have increased during the past three years until she was unable to get about. She gave a history of an illness suggestive of encephalitis following influenza in 1918.

During the past two years she had had

considerable medical care, including five weeks' isolation under psychiatric observation. Alcohol injections of the parotid plexus of the facial nerve had given only temporary relief. Neurotomy of the temporal and zygomatic branches of the facial nerve had also failed, and resection of these branches had been suggested.

Ocular examination revealed a blepharospasm occurring in waves about 4 to 5 minutes apart, lasting 1 to 2 minutes. The spasms were so severe that the lashes disappeared behind folds of skin. No entropion was present. In periods between spasms the lids remained closed, leaving none of the lid margin structure visible. Voluntary attempts to open the eyes resulted in initiating a spasm. The use of pontocaine or cocaine solutions in the conjunctival sac did not change the pattern of the spasm. Ocular examination was possible only by the use of akinesia by the Van Lint or O'Brien methods, both of which were used. Essential ocular findings consisted of a compound myopic astigmatism, peripapillary choroidal atrophy, and a nuclear cataract. The vision was 20/50 in each eye with correction. Associated with the blepharospasm was a head nodding and facial twitching which was accentuated during the periods of lid spasm.

On December 6, 1943, a resection was done of 15 to 20 mm. of the temporal and zygomatic branches of the facial nerve at the exit from the parotid gland. This was followed by a parotitis which subsided promptly. On December 9th, a similar procedure was done on the left side, with uneventful recovery. On the right side, on the eighth postoperative day, a mucopurulent exudate appeared from the upper angle of the wound. This was followed by the appearance of saliva which drained out in considerable quantities when the patient was eating. It had been determined that the parotid duct was

patent and functioning. No sign of trauma or perforation of the gland was visible at the time of surgery. Either trauma or a parotid abscess which ruptured internally formed the basis of the fistula.

The result was extremely satisfactory to the patient. Spasm, which was still present in the corrugator muscle, did not result in complete closure. On digital attempts to open the lids, spasm occurred but the lids could be separated easily. The patient could voluntarily widen the palpebral aperture. The permanence of the result will be reported at a later date.

Robert von der Heydt.

## NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

December 6, 1943\*

DR. SIGMUND AGATSTON, *presiding*

### SYMPOSIUM ON THE RETINAL CIRCULATION

#### THE DEVELOPMENT OF THE CIRCULATION OF THE RETINA

DR. A. L. KORNZWEIG said that the development of the circulation of the retina in a human embryo divides itself naturally into three periods. The first period extends from the third to the fourth week. Numerous capillaries invade the retina, just as they do in the brain, but in the retina they disappear at the end of the fourth week.

The second period, which extends from the end of the first month to the end of the third month, is marked by an entire absence of blood vessels. The retina is nourished indirectly by the hyaloid artery and its branches.

The third period, which begins at the beginning of the fourth month and extends up to term, is characterized by the development of the definitive retinal

arteries and veins from the nerve head. The hyaloid system completely atrophies, but the hyaloid artery, up to the head of the optic nerve, becomes the central artery of the retina. The venous circulation is also established during this period.

Numerous anomalies of the retinal circulation are mentioned, among which are persistent hyaloid artery, remnants of Bergmeister's papillae, prepapillary vessel, anomalous artery or vein in the macular region, congenital tortuosity of the blood vessels, and the cilioretinal artery.

Slides showing the different stages in the development of the retinal circulation were demonstrated.

#### PHYSIOLOGY OF THE RETINAL CIRCULATION

DR. CHARLES ROSENTHAL reviewed the physiology of the retinal circulation with special emphasis on the mechanism of the arterial and venous pulsation of the retinal vessels. Both Bailliar's and Duke-Elder's method for determining the blood pressure of the retinal vessels was discussed. Some consideration was given to the capillary circulation and Puntenney's method for studying the systolic and diastolic pressure in the capillaries.

Upon reviewing the literature on the effects of chemical stimuli on retinal circulation, it was found that in 1934 Lambert devised a method for photographing and measuring the retinal vessels and reported the effects of adrenalin and nitrites. He found a vasodilation after the intravenous use of adrenalin and a vasoconstriction after the use of nitrites. Puntenney, in 1939, using a similar technique, found that no change took place in the retinal vessels after the intravenous injection of adrenalin or the use of nitrites. He found a definite vaso-

constriction after the use of mecholyl. In 1939, Cushick and Herroll found that tobacco and cold both caused vasoconstriction of the retinal vessels.

The contribution of angioscotometry to our knowledge of the retinal circulation was also reviewed. It was shown that anoxia caused a widening of the angioscotomata, whereas increased oxygen inhalation caused a narrowing of the angioscotomata. The oral administration of benzedrine likewise induced a narrowing of the angioscotomata, as did the use of tobacco, whereas the cold pressor test showed a widening of these scotomata.

#### CLINICAL STUDIES IN ANGIOSPASM

DR. ISADORE GIVNER read a paper on this subject which has been published in this Journal (1944, v. 27, Dec., p. 1408.)

#### OCULAR PATHOLOGY OF HYPERTENSION

DR. SAMUEL GARTNER presented a series of slides illustrating the various aspects of this subject.

*Discussion.* Dr. Henry Minsky stated that hypertensive fundus changes are proportional to the systemic blood-pressure readings, if one considers a basic or established level, disregarding fluctua-

tions due to added factors. He is attempting to determine and evaluate these arteriolar changes so as to develop a formula whereby the patient's established and intrinsic diastolic pressure can be estimated. At present this estimation depends on the subjective, clinical impressions of the observer.

Dr. Sigmund Agatston has claimed for years that the discovery of the cause of retinal arteriolar spasm would mean the discovery of the cause of hypertension. The ophthalmoscopic study is of primary importance as the microscopic findings comprise the final, secondary picture. Temporary spasm and closure of the vessels occur, and cases have been seen in which the actual reestablishment of patency was observed. Dr. Agatston has seen changes in caliber take place while studying fundi for periods as long as two hours and believes these vessels later show definite pathologic changes. The vascular occlusion interferes with the nutrition of the vessel walls, which are nourished by the blood they contain, and may result in hyalinization, narrowing, and fibrosis.

Leon H. Ehrlich,  
*Secretary.*

# AMERICAN JOURNAL OF OPHTHALMOLOGY

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## THE OPHTHALMOLOGIST'S RELATIONSHIP TO GROUP PRACTICE

It has become increasingly evident that profound changes are certain to take place in the practice of medicine within the next few years. Trends indicate that prepayment for medical care will rapidly become the rule rather than the exception and that group practice will occupy a much more important place in the near future than at any time in the past. The socialistic trend throughout the civilized world and the strong leaning of our own Government toward the left are important elements in this development. An essential factor for human well-being is the assurance of security in the oncoming

years. This can be obtained only by planning in the present. Economic security cannot be divorced from medical care. It is necessary to provide for every contingency that may interfere with the working capacity of the individual in the future, and one of these obviously is illness.

It is logical, therefore, that a plan to provide for the expenses of illness should be devised. Health insurance seems inevitable for most of the intelligent workers of the world. To maintain a good standard of health requires thorough examinations periodically. Specialists as well as internists must be called upon for such examinations, and although it is theoretically possible to act individualis-

tically in this matter, greater efficiency can obviously be achieved through a group of doctors working in a common center. An almost certain outgrowth of group examinations is group treatment.

There is, too, the demand of patients for thorough physical examinations entirely apart from the insurance matter. Some people are wise enough to appreciate the value of periodic examinations and have the tenacity of purpose to go through with them, but if these tests are to be other than such routine brief examinations as blood-pressure tests and urinalyses much time may be wasted in making appointments and waiting and walking. The public seems to like the group idea. People think that they are getting something complete and fine. Whether they are or not is less certain. Group practice can be either good or bad, depending essentially on whom the group comprises, just as in any other type of practice. The question primarily to be discussed here is not, however, the merits of group care, but the ophthalmologist's relationship to it.

The ophthalmologist's income is different from that of most other physicians in that it depends on multiple small fees from many patients. In other words, he must have volume. It has been the writer's practice to advise his students, almost all of whom plan to practice ophthalmology exclusively, not to settle in a city of less than 25,000 people, because he thinks that a community of less than that number will rarely support an exclusively ophthalmologic specialist. Most of the income is from fees for refraction, and probably one visit in three years would be a fair patient average. It requires no mathematical genius to compute the number of patients that must consult an ophthalmologist for him to earn a living.

Since we all hope for at least this, it

is clear that the ophthalmologist must do nothing that will reduce either his volume of business or his fee per patient visit, unless one or the other rises correspondingly to the lowering of the other. The truth is that in group practice he is in danger of reducing both, but especially of having the fee per visit lowered.

Another unpleasant possibility is that of change in the character of the practice. Most ophthalmologists see many patients sent to them by other physicians, and among these are found many of the more interesting cases, potentially operative and diagnostically stimulating. He may expect to lose much of this practice, for those who have referred patients to him as an individual are not so eager to do so when he is in a group, because they fear that he will be apt to send to others in his group patients who have been referred to him.

Most groups have been founded by internists or general surgeons, very few, if any, by ophthalmologists, and the internist or surgeon is usually regarded as the most important member of the group. Other specialists are relegated to minor roles. The ophthalmologist, about whose work the physician and surgeon know little, must accept one of these minor positions. Obviously his voice in the organization is proportionately small and his share of the income on a like basis. This does not, however, reflect the point of view of the people with regard to their eyes. They realize that on their eyes, more, perhaps, than on any other single sense, rests their happiness and ability to make a living. It is true that their physical and mental equipment must be functioning satisfactorily and that major ailments, such as an attack of appendicitis or an infection, may completely incapacitate them, so that at such times the surgeon or internist becomes all important; in general, however, they give relatively little thought to their general



physical condition until some ailment demands attention. From these facts it follows that the ophthalmologist, backed by the opinion of the community, has a strong conviction of his importance to the welfare of the people and is not prepared for the position which is usually assigned him in a group.

It has been the writer's experience that those of his students who have entered group practice have not been so happy as those who have practiced independently; in fact, most of them have not remained for long in a group. A further reason for this may be that when a group attains a large size and a large number of patients is seen, the ophthalmologic specialty, small as it is, is subdivided, some ophthalmologists being assigned to perform refractions, others to surgery and treatment, others to the study of fundus conditions, so that the danger of having a narrower viewpoint increases and the specialist may correctly be described as one who knows more and more about less and less.

All of the picture, however, is not dark. The ophthalmologist can refer patients within the group without having to think constantly of the cost to the patient. He is usually relieved of the onerous task of assessing fees and trying to collect them. The individual is his own hardest taskmaster, and undoubtedly in group-practice work hours are shorter and there is less stress on the physician.

To mention another disadvantage, and really a very important one to most democratic people, is the giving up of individual independence to some degree. Though it is true that the physician practicing alone is the servant of every one, he is not the servant of any particular one nor of a small group. His practice does not depend on the action of any one person or small number of persons. Certainly, if he finds the group association

incompatible, he is at liberty to withdraw, but this is not an easy thing to do. Much of the practice will have come to him because of his group association and in many cases he is only the ophthalmologist of the group, is scarcely known by name to the patients, and is often quickly forgotten by them, for they recall only the name of the clinic. In other words, he cannot take his practice with him if he decides to leave. There is the further disadvantage that he may not be able to choose the time of his withdrawal but may be asked unexpectedly to sever his connection with the organization.

Undoubtedly, there are many ophthalmologists who have found great happiness in group practice and equally surely this form of handling patients will become increasingly prevalent. So it behooves all physicians to give serious thought to the matter. This, as every other form of medical care, will, in the long run, stand or fall as measured by its success in the care of patients. The extent of the turnover to group care will depend on this; but though the trend seems definitely in this direction there will probably always be a place for those who wish to practice independently.

Lawrence T. Post.

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### "OPHTHALMIC ASSOCIATES"

There was a shortage of ophthalmologists long before the current war. This shortage is a continuing trend. The problem of distributing medical care in this field is not likely to be met by conventional measures and methods now in sight. There probably are a number of partial solutions, each of which would contribute toward solving the problem. Increasing or doubling the number of eye physicians in training at teaching centers would partly remedy the need.

Another real contribution toward more physicians in our field would follow the adoption of a new definition of what constitutes an ophthalmologist—the recognition of two groups in the speciality: (a) the medical ophthalmologist, concerned with other than the major surgical aspects of practice, and widely distributed in both small and large communities; (b) surgical ophthalmologists, fewer in number, more elaborately trained in the surgical field and distributed in centers for surgical treatment. This is actually the situation today in practice, although its benefits from the standpoint of wide distribution and safe practice are limited because teaching is not directed into these dual channels and no provision is made for officially recognizing more than one kind of ophthalmologist.

A third method of amplifying eye care, both medical and surgical, is by creating a new professional personnel. A move toward this end is seen in the orthoptic-technician group. Their well-thought-out program has established a national organization of technicians under an orthoptic council, but too few are trained in this field to meet the demands. This is partly due to war dislocation and lack of training centers, but also a certain lack of appeal is to be found in this field because of its limited scope. By widening the base of the orthoptic group, or by creating another professional group, there could be evolved an exceedingly important personnel concerned with increasing medical care of the eye patient. This group, "Ophthalmic Associates," should include in its domain measurement of refractive errors, perimetry, orthoptics, some bacteriology and other laboratory techniques, office and hospital assistance. In practice with this group the responsibility of the care of the eye patient remains with the eye physician. This new

group would have a professional standing and association with the physician and would extend both his range and improve his standards. To bring this association to its proper high level requires mutual understanding and respect between both physician and ophthalmic associates, somewhat as medicine marches along with the biologic sciences as co-workers in overcoming the problems of disease. It is not a matter of dominance, but of participation and responsibility. This suggested agency—that of "Ophthalmic Associates"—offers a professional field for those who will take the necessary training. To meet satisfactory educational standards in this group would require four years of college-level training, two in the literary school and two in the technical subjects, leading to a B.S. degree. This curriculum could be supplied by the widely distributed existing educational agencies, but a more active participation by the medical profession in the teaching program would be necessary during the last two years. The medical and educational professions have yet to meet their full responsibilities in this educational field.

Many eye physicians have in their office or hospital practices individuals, self or preceptor trained, whose services have become indispensable and who reduce the onus of the routine. They greatly extend the coverage of medical practice. One or several Ophthalmic Associates working with the physician would greatly enlarge his capacities to meet his responsibility of medical care.

Parker Heath.  
Detroit, Michigan

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#### WHY CORRECT HYPEROPIA?

To most ophthalmologists the answer to this question is so obvious as to make

the question itself appear ridiculous. Yet it is a question asked, although in less technical language, by many patients; and it is a question which still persists in the minds of some ophthalmologists and some refracting opticians, and very certainly in the minds of a good many general physicians.

Usually, the question is stated in the following form: Why should we prescribe glasses, especially for constant use, if the patient can see perfectly without correction? In a case in which the question was recently overheard by the present writer, the patient, a woman in the twenties, had complained of persistent headache.

The headache in such a case appears basically to be due to fatigue. It is not so very important whether we think of this fatigue as residing in the muscle of accommodation or in the nerves which control that muscle. Any muscle or set of muscles, and any set of nerve fibers controlling such muscular unit, demands frequent intervals of relaxation. Even the muscles of the heart, that great organ which comes nearest to a state of constant activity, have their rhythmic intervals of relaxation.

In dealing with the tiny intrinsic muscular system of the eye, it is true that different individuals vary greatly in their tolerance or intolerance for continuance performance of the necessary act of accommodation. Many persons with appreciable amounts of hyperopia go through much of their lives with never a visit to an ophthalmologist or an optician, and are unwilling to admit that they have ever experienced fatigue due to use of the eyes. Some of them even assure us that they use their eyes very little, and are rather taken aback when told that during the usual sixteen-hour waking day the eyes are constantly used, although perhaps not for near work.

During distant vision the ametropic eye is approximately at rest, so far as use of the ciliary muscle is concerned, but the hyperopic eye must make an effort of accommodation even in looking at distant objects. Thus, except during complete closure of the eyes or the very fractional intervals provided by the act of blinking, the hyperopic eye is deprived of the opportunity for complete relaxation. The same is true of the hyperopic eye whose refractive error is only partially corrected.

Many persons develop symptoms of fatigue or eyestrain from very small errors of hyperopia. It seems probable that no one with even a low uncorrected hyperopia can attain in all circumstances, and throughout the working day, that maximum of efficiency of which he would be capable if the hyperopia were completely corrected. The mere lack of opportunity for complete ocular relaxation during the waking hours would seem to point to this conclusion.

It is true that many hyperopic school children offer no complaint of discomfort, and are either unwilling, or are not permitted by their parents, to wear glasses, even after some question related to school activity or general health had led to a diagnosis of hyperopia. It is also true that, in the presence of a prejudice against the wearing of glasses, physicians have suggested technique for getting along without hyperopic corrections. However, there can be little doubt that Nature exacts some penalty for such procedures, and that, either in very minor or in much greater degree, the career of the individual is modified by refusal of the refractive correction.

If failure to correct a low hyperopic error may produce an adverse effect in the life of an individual, what reason can there be to suppose that leaving undercorrected a like amount of hyperopia

in another individual with a much greater total error will not also be capable of doing mischief? This is a problem for serious consideration by those who are in

the habit of giving only partial corrections for the larger amounts of hyperopic error.

W. H. Crisp.

# ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

## CLASSIFICATION

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|--|--|
| 1. General methods of diagnosis                        | 10. Retina and vitreous                                |
| 2. Therapeutics and operations                         | 11. Optic nerve and toxic amblyopias                   |
| 3. Physiologic optics, refraction, and color vision    | 12. Visual tracts and centers                          |
| 4. Ocular movements                                    | 13. Eyeball and orbit                                  |
| 5. Conjunctiva   | 14. Eyelids and lacrimal apparatus                     |
| 6. Cornea and sclera                                   | 15. Tumors   |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries   |
| 8. Glaucoma and ocular tension                         | 17. Systemic diseases and parasites                    |
| 9. Crystalline lens                                    | 18. Hygiene, sociology, education, and history         |
|  | 19. Anatomy, embryology, and comparative ophthalmology |

### 1

#### GENERAL METHODS OF DIAGNOSIS

Bedell, A. J. **Ophthalmoscopy and the diagnosis of human illness.** *Amer. Jour. Ophth.*, 1945, v. 28, Feb., pp. 139-147.

Gray, C. C., and Moor, W. A. **Serologic studies in acute eye diseases.** *Amer. Jour. Ophth.*, 1945, v. 28, Feb., pp. 180-186. (One table, references.)

Oliveres, Antonio. **Retinometric loupe.** *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, Jan.-Feb., pp. 96-97.

The loupe presented is composed of two plano-convex lenses of +7.50D. strength. On the plane surface of one of the lenses is engraved a reticule, each square of which is 5 mm. wide. The two lenses are united by means of Canada balsam. The loupe is used in indirect ophthalmoscopy with the inverted image, and makes the measurement of retinal lesions easy.

J. Wesley McKinney.

### 2

#### THERAPEUTICS AND OPERATIONS

Brücher Encina, René. **Nonspecific desensitization treatment in some eczematous eye diseases.** *Arch. de Oft. de Buenos Aires*, 1942, v. 17, Dec., p. 748.

In a series of 16 patients with various manifestations of ocular allergy in which specific allergens could not be found, the author used autohemotherapy with remarkable success. First, 10 c.c. of calcium-bromolactobionate (calcibronat) was given intravenously, and then, before withdrawing the needle, 10 c.c. of blood was aspirated into the same syringe, and quickly injected intramuscularly in the buttock. Marked improvement was obtained in 14 patients. A correct diagnosis is of paramount importance for therapeutic success, and tuberculous, syphilitic, and focal-infection cases should be excluded from this method of treatment.

Plinio Montalván.

Cogan, D. G., and Hirsch, E. O. The cornea. 7. Permeability to weak electrolytes. *Arch. of Ophth.*, 1944, v. 32, Oct., pp. 276-282.

Experiments conducted on excised corneas indicate that the permeability of various weak organic electrolytes is a function of the degree of dissociation of the electrolyte. The preparations tested include analine, salicylic acid, atropine, pilocarpine, and ephedrine. It was found that the organic bases penetrated the cornea, while their salts did not. This corroborates the previous observation that the corneal epithelium and endothelium are barriers to substances not soluble in fats. The free base has the power of penetrating the epithelium-stroma combination, while the salt penetrates the stroma only. Conjunctiva-sclera combinations behaved in a similar manner. Experiments on the intact rabbit cornea in vivo indicate that the permeability of analine is a function of dissociation.

The permeability of an alkaloid through the cornea may be predetermined if one knows the dissociation constant and the solubility properties of the drug. A knowledge of these factors influencing permeability may make it possible to select more suitable drugs for ocular therapeutics. Other factors, however, apply some limitations to the selection of the more permeable agents. Thus many alkaloids are unstable in aqueous solution unless acidified. In addition, the buffer action of the tears will determine the hydrogen-ion concentration of a weak solution as soon as it is instilled. Thus there is no advantage in employing solutions of alkaloid bases instead of the salts, and considerable disadvantage may arise from decomposition of the base. (3 tables, 4 figures, references.)

John C. Long.

Cordes, F. C. Typhoid-vaccine therapy; an unusual reaction. *Quarterly Bull. Northwestern Univ. Med. School*, 1944, v. 18, no. 3, pp. 184-192.

The author calls attention to the risks which one may incur following intravenous typhoid-vaccine therapy.

A 59-year-old woman developed acute congestive glaucoma. Iridectomy was performed. Three months later the eye again became red and painful, this time from acute iridocyclitis. Physical examination was negative except for the faintest possible trace of albumin in the urine. She received 7 million bacilli of a typhoid vaccine intravenously and 48 hours later 15 million bacilli. After an initial chill the temperature suddenly rose to 43°C. and hovered for two hours at 42°C. The patient lost consciousness and became incontinent and cyanotic and there was a large amount of emesis. Only a small amount of urine was obtainable by catheterization. This showed 4+ albumin and the centrifuged sediment was packed with white and red blood cells. On the third day the blood pressure rose to 200/100 mm. Hg. The patient eventually recovered.

The unusual reaction took the form of the hepatorenal syndrome. This consists of drowsiness or somnolence, emesis, anuria or oliguria, icterus, fever, hemorrhages in the mucous membranes, rise in blood-nonprotein nitrogen and creatine, hematuria, albuminuria, and semicomatose, frequently with decreased CO<sub>2</sub> combining power of the blood plasma.

Two forms of the syndrome are described, rapid hyperpyrexia, liver death or liver shock, and the delayed or protracted form of the liver-kidney complex. The former is fatal in one to three days. In the latter death is delayed for

12 to 14 days, but some cases recover. (References.) R. Grunfeld.

La Rocca, V. Intraocular injection of penicillin in ocular infections. *Amer. Jour. Ophth.*, 1945, v. 28, Feb., pp. 183-186. (2 figures.)

Law, F. W. *Ophthalmology*. The Practitioner, 1944, v. 153, Oct., p. 233.

The author describes recent advances and modern trends in ophthalmic therapy. Local application of sulfa drops in various types of external diseases of the eye he has not found more advantageous than use of other anti-septics. Sulfanilamide taken by mouth is of no value in iritis, iridocyclitis, or choroiditis. It is of proved value in ophthalmia neonatorum and in early cases of endophthalmitis. Penicillin is a very promising drug in blepharitis and in superficial infective conditions.

In corneal injuries with prolapse of the iris corneal sutures are preferred to a conjunctival flap, because apposition of the wound edges is more accurate. The method has the disadvantage that the sutures may cause local infiltration in the avascular cornea, with permanent loss of vision and even ulceration and sloughing.

In phlyctenular ophthalmia, unless the condition of the lungs forbids it, a general ultraviolet-light bath is of proved value. Ultraviolet light is rarely used nowadays for local therapy, although recurrent corneal erosions heal well under it.

Any kind of intraocular inflammation is helped by the application of diathermy, of which the most effective form is the ultrashort wave. It is advised mostly in glaucoma, choroiditis, and postoperative reactionary endophthalmitis. Diathermy is so much more efficient than any other form of heat

therapy as to suggest that some hitherto uninvestigated electrical effect on living cells and tissues plays a part.

Other topics discussed are: removal of nonmagnetic foreign bodies, enucleation of dangerous eyes, pentothal anesthesia, and vitamin therapy.

R. Grunfeld.

Mietus, C. A. Ocular therapy with penicillin used topically, intraocularly, and systemically. *Amer. Jour. Ophth.*, 1945, v. 28, Feb., pp. 173-179. (References.)

Milner, J. G. Penicillin in ophthalmology. *Brit. Med. Jour.*, 1944, Aug. 5, pp. 175-178.

This report covers a series of cases investigated by many observers who give in tabulated form the results obtained in different types of disease and infection, and the doses employed. The drug was used in liquid (500 Oxford units per c.c.) or in ointment (100 Oxford units per gm.). The drops are potent for four hours and the ointment for six hours. The frequency of treatment is to be regulated accordingly. The observers agree that penicillin affords the best results in blepharitis. There seems to be some difference of opinion as to its value in cases of acute conjunctivitis. Other definite indications for the use of penicillin are found in corneal ulcers, dacryocystitis, recurrent styes and chalazions, and immediately after operative procedures. It is also valuable as a prophylactic in cases of injury.

M. Lombardo.

O'Brien, C. S. Random observations on ocular surgery. *Quarterly Bull. Northwestern Univ. Med. School*, 1944, v. 18, no. 3, pp. 199-203.

In operating for cataract in children, juveniles, and young adults, a prelimi-

nary needling followed within a few days by linear extraction is preferred to repeated needling. The incision for cataract extraction is made with a keratome and scissors. In extracapsular extraction it is advisable to use capsule forceps rather than the cystotome, because the former removes a larger portion of the capsule and lens epithelium. If, after the lens has been delivered and the sutures tied, the iris has a tendency to prolapse it can be kept in position by injection of air into the anterior chamber. If dissection fails to make a good opening in a secondary membrane, a small opening at the limbus will allow one to insert a sharp iris hook so as to pull out the membrane and snip it off with scissors.

When glaucoma simplex and cataract exist together Lagrange sclerectomy is combined with cataract extraction. Following any operation for glaucoma the eye should be massaged twice a day for several weeks. The incision for a basal iridectomy should be made with a Graefe knife and not with a keratome, because one cannot make an incision in the chamber angle with the latter.

The results are better if the operation for strabismus is deferred until retinal correspondence is made normal. It seems preferable to correct an ordinary squint by a two-stage operation.

In enucleation it is well to suture the recti muscles with a purse-string silk suture, inserting the suture at the end of each muscle just before the tendon is severed. Tying the suture immediately after the globe is removed will assist greatly in hemostasis.

R. Grunfeld.

Rodin, F. H. Heat and cold in therapy of the eyes. *Arch. of Ophth.*, 1944, v. 32, Oct., pp. 296-300.

Heat and cold have been used in ocular therapeutics since antiquity. Heat produces a vasodilatation of the tissues which not only affords comfort but also stimulates repair by accelerating metabolism and leukocytosis. It is recommended for mild keratitis, mild blepharitis, acute conjunctivitis, corneal ulcer, and many intraocular and lid conditions. Cold has an analgesic and therapeutic effect, acting largely through vasoconstriction. It is especially valuable for the relief of lesions produced by physical or chemical trauma, early conjunctivitis, blennorrhoea, and acute trachoma, and for post-operative care.

Various methods of applying heat and cold to the eye have been described. Many of these methods require such elaborate equipment or are so troublesome that their usefulness is restricted. The author describes the application of heat by means of a wooden household spoon encased in cotton. The bowl of the spoon is filled with cotton, and cotton also is applied to the back of the spoon. A 5 cm. gauze bandage is wrapped around the cotton in the form of a figure 8 and securely tied. The wrapped spoon is dipped in a basin of hot water, the excess of water shaken off, and the spoon is then applied to the eye. This is repeated as soon as the cotton cools. The author finds this method simple, convenient, and effective. Cold compresses may be applied to the eye by means of the wooden spoon or, simpler, by application of cotton that has been dipped in a mixture of water and ice. (2 photographs, references.) John C. Long.

Siniscal, A. A. The Siniscal-Smith lid everter. *Amer. Jour. Ophth.*, 1945, v. 28, Feb., pp. 198-200. (4 figures.)



Wright, R. E. The local application of penicillin solution to the eye. *Brit. Jour. Ophth.*, 1944, v. 28, Nov., pp. 574-575.

Two contrivances to permit regular continuous instillation of solutions for the conjunctiva and cornea without nursing care are described. One is efficacious only while the patient is awake but the other functions also while the patient is asleep.

Edna M. Reynolds.

Young, J. H. The effects of faradically induced currents upon the extrinsic and intrinsic ocular musculature. *Brit. Jour. Ophth.*, 1944, v. 28, Oct., pp. 488-502. (See Section 4, Ocular movements.)

### 3

#### PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Eames, T. H. Amblyopia in cases of reading failure. *Amer. Jour. Ophth.*, 1944, v. 27, Dec., pp. 1374-1375. (One table.)

McFarland, R., Halperin, M., and Niven, J. Visual thresholds as an index of physiological imbalance during anoxia. *Amer. Jour. Physiology*, 1944, v. 142, Oct. 1, p. 328.

The differential sensitivity of the human fovea was studied in relation to light intensity under normal oxygen tension and during a constant degree of oxygen deprivation (10.8-percent oxygen) in a low-oxygen chamber. Final measurements were made while the subjects breathed 100-percent oxygen through a nasal catheter. Nine subjects were used in these experiments. The manner in which the effect of anoxia on differential thresholds varies with the degree of oxygen deprivation

was studied on two subjects. The changes in visual sensitivity are plotted in relation to time, decrease in arterial oxygen saturation, and equivalent altitude, corresponding to the oxygen tension. The increase of the differential threshold is initially proportional to loss of arterial-oxygen saturation, but then tends to level off so that smaller increases result from further losses. The changes in the differential threshold plotted against equivalent altitudes are described with a sigmoid curve. Changes in visual sensitivity are discussed as an index of physiologic imbalance in the organism.

Theodore M. Shapira.

Mann, Ida. A study of eighty-four cases of delayed mustard-gas keratitis fitted with contact lenses. *Brit. Jour. Ophth.*, 1944, v. 28, Sept., pp. 441-447. (See Section 16, Injuries.)

Sinclair, J. G. The lens in accommodation. *Amer. Jour. Ophth.*, 1945, v. 28, Jan., pp. 38-39. (One drawing, references.)

Sloane, A. E. Refraction clinic. *Amer. Jour. Ophth.*, 1945, v. 28, Feb., pp. 200-201.

Swan, K. C. Definition of anomalous retinal correspondence. *Amer. Jour. Ophth.*, 1945, v. 28, Jan., pp. 58-61. (References.)

Taylor, W. O. G. A gas-mask wafer for presbyopia. *Brit. Jour. Ophth.*, 1944, v. 28, Sept., pp. 461-465.

A lens wafer to assist near vision is cemented to the laminated safety glass of the respirator lens. The device can be used with or without additional correction for ametropia. (3 diagrams.)

Edna M. Reynolds.

Traquair, H. M. Headaches, giddiness, and eyestrain. *The Practitioner*, 1944, v. 153, Sept., pp. 166-171.

The writer states that probably less than ten percent of headaches are due to ocular causes. He discusses the features of headaches as to their location, character, periodicity, and duration, the age of the patients, social, occupational, and sex incidences, and visual symptoms. The chief factor in the production of ocular headaches is the maintenance of binocular vision. If the vision is good in one eye and moderately bad in the other, headaches may be caused, for in this case binocular vision is difficult; but if one eye is amblyopic so that it cannot participate actively in vision headache is unlikely to result. In some cases the dissociation of accommodation and convergence renders maintenance of binocular vision difficult. The general condition of the patient's health, the physical and nervous and mental states, may be determining factors; feeble physique and resisting power, neuropathic disposition, anemia, constipation, inadequate or improper diet, lack of proper rest, are important elements in patients of hypersensitive nature. M. Lombardo.

## 4

## OCULAR MOVEMENTS

Adrogué, E., and Re, B. V. A case of voluntary nystagmus. *Arch. de Oft. de Buenos Aires*, 1942, v. 17, Dec., p. 717.

The authors describe the clinical picture of voluntary nystagmus and discuss the pathogenic mechanism and differential diagnosis, giving a résumé of all the cases they could find in the literature. They report a case of voluntary nystagmus observed in a 28-year-old man who could produce at will rapid oscillatory movements of the eyes

in any position of gaze. The maximum speed of movement was from two to three oscillations per second, with a displacement of the eyes of 2 to 3 mm. The optic nerves showed colobomatous pits of the papilla, more marked in the left eye, with an extensive bilateral field defect involving the upper nasal quadrants. After twenty to thirty seconds of oscillatory movements, the patient complained of marked ocular fatigue, a point that the authors emphasize as typical of voluntary nystagmus. (Fundus pictures, visual-field chart, bibliography.)

Plino Montalván.

Boyle, M. O. The frequency of squint. *Amer. Jour. Ophth.*, 1944, v. 27, Dec., pp. 1413-1416. (References.)

Chouké, K. S. Repair following tucking operations on the extraocular muscles. *Amer. Jour. Ophth.*, 1945, v. 28, Jan., pp. 50-55. (3 figures, references.)

Dicke, Debora. Essential requirements for a good orthoptic department. *Amer. Jour. Ophth.*, 1944, v. 27, Dec., pp. 1417-1421.

Drye, L. B. Precautions necessary in orthoptic training. *Amer. Jour. Ophth.*, 1944, v. 27, Dec., pp. 1422-1424.

Elliot, A. J. Congenital deficiency of abduction of the eyes (Duane's syndrome). *Jour. Canadian Med. Services*, 1944, v. 1, pp. 437-443.

The author presents three cases of Duane's syndrome, a condition which has at times been confused with various neurologic lesions. After referring to the historic aspects of this complex, the symptoms of retraction of the globe, narrowing of the palpebral fissure, and ptosis are explained. The

only treatment recommended is a moderate recession of the internal rectus if marked strabismus or diplopia is present. Francis M. Crage.

Kino, F. F. Eye movements in electrical-shock procedure. *Jour. Mental Science*, 1944, v. 90, April, p. 592.

Observations were made of the eye movements resulting from symmetrical, equal, and simultaneous stimulation of the frontal lobes in the electric-shock procedure. In the postconvulsive or last stage of the four-stage-shock picture a forceful lateral conjugate deviation was noted as a constant feature, characteristic of a given individual. This individual pattern of eye deviation was uninfluenced by age, sex, or type of mental disorder.

Francis M. Crage.

Regan, W. W., Gregory, P. W., and Mead, S. W. Hereditary strabismus in cattle. *Jour. of Heredity*, 1944, v. 35, Aug., p. 233.

Normal at birth, several animals were found to manifest convergent strabismus when 6 to 12 months old. The degree varied, being so severe in some mature animals as to greatly impair vision. Abnormal bulbar protrusion existed in some. Inherited as a result of introduction into the herd of two unrelated bulls, the occurrence promptly stopped after use of homozygous normal bulls.

Francis M. Crage.

Smelser, G. K. The oxygen consumption of eye muscles of thyroidectomized and thyroxin-injected guinea pigs. *Amer. Jour. Physiology*, 1944, v. 142, Oct. 1, p. 396.

The oxygen consumption of the extraocular muscles in normal guinea pigs is much higher than that of the

other muscles studied. This difference is less in the muscles of thyroxin-treated animals. The effect of thyroid hormone on the water content of muscle tissue appears to vary in different muscles, and to be entirely separate from its effect on their metabolism. Although the thyroid hormone markedly increases oxygen consumption of the diaphragm, it has very little effect on that of eye muscle. This suggests that the enzyme systems which are the site of action of the thyroid hormone are present in variable amounts, or vary in activity, in different muscle tissues.

Theodore M. Shapira.

Swan, K. C., and Laughlin, E. Binocular orthoptic training for amblyopic patients. *Arch. of Ophth.*, 1944, v. 32, Oct., pp. 302-303.

The generally prevailing concept that visual acuity of 6/15 or better is essential for orthoptic training no longer applies. The peripheral fields play a predominant role in fusional movements. Focal fixation is desirable so that the cover test may be utilized for adjustment of orthoptic instruments. If it is not present, illuminated instruments may be adjusted so that the corneal reflexes are symmetric. In patients with poor visual acuity due to a central scotoma, training must be directed toward peripheral fusion.

Orthoptic targets containing fine details are of little value for this purpose. Simple disc and ring targets subtending angles larger than the central scotoma are applicable. In cases of eccentric fixation due to anomalous retinal correspondence no attempt should be made to develop fusional movements until normal correspondence has been developed. In those cases the ring targets should be used along

with occlusion of the eccentrically fixating eye to establish normal correspondence. The authors state that development of peripheral fusion assures the patient a permanent correction of the deviation and in some instances a partial return of central vision in the amblyopic eye.

John C. Long.

Walsh, F. B. Myasthenia gravis and its ocular signs: a review. *Amer. Jour. Ophth.*, 1945, v. 28, Jan., pp. 13-33; also *Trans. Amer. Ophth. Soc.*, 1943, v. 41, pp. 556-624. (9 illustrations; bibliography.)

Yaskin, J. C., and Oller, C. I. Oculomotor paralysis: some practical considerations from the anatomic, etiologic, and clinical standpoints. *Clinics*, 1944, v. 3, Oct., p. 693.

Etiologic diagnosis of third-nerve paralysis is at times extremely difficult. Frequently it is the "earliest monosymptomatic expression" of some obscure systemic disturbance or a primary symptom of some brain lesion. The authors mention the most common pathologic states giving rise to the paralysis.

Anatomic, clinical, and etiologic considerations are discussed, with tables and diagrams. Seven illustrative cases include glioma, multiple sclerosis, and Benedict's syndrome.

Francis M. Crage.

Young J. H. The effects of faradically induced currents upon the extrinsic and intrinsic ocular musculature. *Brit. Jour. Ophth.*, 1944, v. 28, Oct., pp. 488-502.

To study the clinical effect of the faradic currents upon the extrinsic and intrinsic muscles of the eye, the author performed a series of experiments upon

himself. Faradic stimulation of the left internal rectus was carried out, using the Smart-Bristow coil. The Maddox Wing test was used to register the amount of contracture of the internal rectus, while the degree of spasm of the ciliary muscle was estimated by the strength of the minus lens required to render the left eye emmetropic for distance.

Three important ocular signs, namely exophthalmos, nystagmus, and spasm of accommodation were produced. The experimental signs and symptoms are listed and the physiology of the reactions is discussed. The author feels that, with general anesthesia, faradism should prove useful in treating various muscular anomalies resulting from war trauma and also in the diagnosis and prognosis of ocular-muscle lesions. (References.)

Edna M. Reynolds.

## 5

### CONJUNCTIVA

Gardiner, P. A. Observations on the transparency of the conjunctiva. *Brit. Jour. Ophth.*, 1944, v. 28, Nov., pp. 538-554.

With a view to defining some of the normal appearances of the conjunctiva and to elucidating the causes of deviation from the normal, a large group of subjects was examined. These were of both sexes, of different nationalities, living under different climatic conditions, and on different diets. The age range was from 9 to 37 years. Examination was made with the slitlamp with a wide beam slightly out of focus, to give bright diffuse illumination.

The transparency was assessed by noting the relative visibility of the deep vessels on the sclera. In subjects in whom the transparency was affected

by the presence of pingueculae or by diffuse hyaline degeneration, the areas thus involved were ignored and the transparency of the unaffected parts was recorded. A total of 1,892 men, 434 women, and 591 children were examined.

Every degree of transparency was represented in the adults, but in the children the conjunctiva was found to be opaque or opalescent. It is a normal phenomenon for the conjunctiva to increase in transparency between the ages of 9 and 37 years. The females showed constantly a more transparent conjunctiva than the males between the ages of 9 and 27 years.

Nutritional factors were found to play a part in influencing the transparency of the conjunctiva. A poor diet is accompanied by a relatively transparent conjunctiva and a good diet by a relatively opaque conjunctiva. Addition of vitamin A to the diet caused no change in the transparency of the conjunctiva. No change was seen in cases where ascorbic acid was added to the diet, but the addition of liver caused a noticeable increase in conjunctival opacity and an appreciable decrease in corneal vascularization.

Clinically, a transparent conjunctiva in children and young adults should be regarded as abnormal and should lead to investigation into possible dietary deficiency or metabolic disturbances. (13 tables, 4 graphs, references.)

Edna M. Reynolds.

Herraiz Ballester, Leopoldo, and Jolly, C. H. Nonseasonal allergic conjunctivitis. *Arch. de Oft. de Buenos Aires*, 1942, v. 17, Dec., p. 759.

The authors report two cases of allergic conjunctivitis characterized by itching, sensation of foreign body, photophobia, lacrimation, and marked

conjunctival injection, with scanty discharge. There were no follicles or papillae present, and instillation of adrenalin produced considerable relief. Evidence of inhaling allergens in the form of vegetable fibers, animal hair and dandruff, house dust, and atmospheric dust was discovered in each case, and vaccine containing these substances produced rapid and permanent cures. Plinio Montalván.

Lemoine, A. N., and Lemoine, A. N., Jr. Penicillin in the treatment of purulent conjunctivitis. *Amer. Jour. Ophth.*, 1944, v. 27, Dec., pp. 1428-1429. (References.)

McNair, S. S. Gonorrheal ophthalmia. *United States Naval Med. Bull.*, 1944, v. 43, Sept., p. 532.

The author describes two cases in which gonorrheal ophthalmia was presumably contracted by use of the same pair of binoculars which had been infected from an unknown source. The left eye became affected in both persons at the same time. In spite of early treatment with sulfathiazole and penicillin, one patient lost his eye.

R. Grunfeld.

Rados, Andrew. Epidemic keratoconjunctivitis and virus diseases of the eye. *Arch. of Ophth.*, 1944, v. 32, Oct., pp. 308-329.

This article is a comprehensive review of the virus and rickettsial diseases of the eye. One of the diseases with which ophthalmic symptoms commonly occur is encephalitis. This may result in paralysis and spasms of the ocular muscles as well as retrobulbar neuritis and papilledema. Mumps may be responsible for keratitis, dacryadenitis, scleritis, uveitis, neuritis, and ocular palsies. Varicella has been

known to produce corneal lesions. Recent observations indicate that lymphogranuloma venereum may involve the eye. Gregg and others have recently shown that rubella in early pregnancy produces multiple congenital abnormalities in the offspring. These abnormalities include microphthalmos and cataract as well as systemic conditions such as heart defects, microcephaly, and deafmutism.

The rickettsias are apparently pleomorphic bacteria adapted to arthropod tissues. They are considered to belong to an intermediate class between viruses and bacteria. Ocular complications are observed with typhus. Mild conjunctivitis occurs with Rocky Mountain spotted fever. Severe inflammatory complications in the anterior segment of the eye have been observed in tsutsugamushi fever.

Viruses, like the rickettsias, are linked with living cells, either in the body or in cultures containing living cells. They are not capable of reproduction in the absence of living tissue. The nature and characteristics of viruses are discussed in considerable detail.

The first epidemic of epidemic keratoconjunctivitis recorded in the literature appeared in 1889 in Vienna. Epidemics have since occurred in Bombay, Madras, Malaya, Tasmania, Calcutta, Germany, and the United States of America. Details of the clinical findings in the various epidemics are recorded. It is thought that epidemic keratoconjunctivitis is caused by a virus related to the herpes virus or to a similar filterable virus. The disease has been transmitted to human volunteers and the etiologic agent can be grown in the living chorioallantois of chicks. The question whether superficial punctate keratitis and nummular

keratitis are two varieties of epidemic keratoconjunctivitis or are distinct diseases will require further investigation.

The numerous investigations conducted to determine the cause of trachoma are reviewed. The steps in the study of inclusion bodies are given in some detail. The rickettsial origin of trachoma has been advanced by some observers and denied by others. It is now assumed that trachoma is caused by a virus and that this virus is similar to the one that causes swimming-pool conjunctivitis and inclusion blennorrhea.

Herpes simplex was first transmitted experimentally to the scarified cornea of rabbits by Grueter in 1912. The filterability of the herpes virus has since been demonstrated. The virus of herpes zoster is thought to be possibly identical with, or at least closely related to, that of varicella. The lack of susceptible experimental animals has prevented its extensive study. The etiologic agent of molluscum contagiosum is filterable and may be multiplied in the chorioallantoid membrane of hens' eggs. Inclusion bodies are found in the epithelial lesion. The virus of warts is also filterable but as yet it has not been cultivated. (Bibliography.)

John C. Long.

Roethth, A. F. de. Congestion in the upper quadrant of the bulbar conjunctiva, a sign of focal infection? Quarterly Bull. Northwestern Univ. Med. School, 1944, v. 18, no. 3, pp. 193-198.

The author describes a new sign, the upper-quadrant sign, which he observed in 15 persons, in 13 of them bilaterally. The patients complained of a mild burning sensation in the eye, scratchy feeling, and lacrimation. The eyeball seemed to be normal except for a net of dilated vessels of the bulbar con-

junctiva above the cornea. The episcleral vessels were not involved and the palpebral conjunctiva only rarely.

The sign seems to point to a focal infection, for in all but one of these cases foci of infection were present. The author applies the toxin-allergy theory of endogenous uveitis to explain the upper-quadrant sign. (Eleven case histories.) R. Grunfeld.

Sorsby, A., Hoffa, E. E., and Young, E. N. *Virus ophthalmia neonatorum*. Brit. Jour. Ophth., 1944, v. 28, Sept., pp. 451-457.

A study of 28 cases of inclusion blennorrhea among 269 cases of ophthalmia neonatorum treated at White Oak Hospital from January 1, 1942, to December 31, 1943, is reported. The diagnosis was made by finding inclusion bodies in scrapings from the conjunctiva. One of the 28 cases could hardly be designated as ophthalmia neonatorum since the ophthalmia occurred in a boy aged two years. The smear and culture showed an abundance of *Staphylococcus aureus*. Of the remaining 27 cases, no organisms were present either in the smear or the culture in 24; one showed inclusion bodies and Koch-Weeks bacilli; and another showed inclusion bodies and hemolytic streptococci.

Apart from a later onset in most cases, but not in all, inclusion blennorrhea has no distinguishing features from microbial ophthalmia neonatorum, either in its course or in response to sulfonamide therapy. In five out of 25 mothers of infants with inclusion blennorrhea, cervical scrapings showed inclusion bodies. (5 illustrations, references.)

Edna M. Reynolds.

Vila-Coro, Antonio. *Severe purulent*

*conjunctivitis of the newborn*. Arch. de la Soc. Oft. Hisp.-Amer., 1944, v. 4, Jan.-Feb., pp. 18-25.

Four cases of severe purulent conjunctivitis of the newborn are reported. The affection has all the characteristics of a severe gonorrheal ophthalmia and invariably involves the cornea. Perforation usually ensues. In a few cases panophthalmitis results. No causative organism has been found, but it is supposed that a virus is the noxious agent. The course of the disease is not altered by any known treatment.

J. Wesley McKinney.

## 6

### CORNEA AND SCLERA

Alpert, D. R. *Intraocular injection of penicillin in the case of ring abscess of the cornea*. Amer. Jour. Ophth., 1945, v. 28, Jan., pp. 64-67. (References.)

Castroviejo, Ramón. *Keratetectomies for the treatment of corneal opacities*. Trans. Amer. Ophth. Soc., 1943, v. 41, pp. 222-238. (See Amer. Jour. Ophth., 1944, v. 27, Dec., p. 1455.)

Chesney, A. M., and Woods, A. C. *Further observation on the relation of the eye to immunity in experimental syphilis. 2. The development of immunity after primary intracorneal inoculation*. Jour. Exper. Med., 1944, v. 80, Nov. 1, p. 357.

Two experiments are reported in which an attempt was made to determine the extent to which a primary syphilitic infection of the cornea in rabbits is followed by the development of a local corneal immunity, by the generalization of the virus, and by the development of a general immunity to the infection. Female rabbits were in-

oculated intracorneally with a virulent strain of *T. pallidum*, and the disease was allowed to run its course until the lesions which had developed at the site of inoculation had healed spontaneously. Transfer of popliteal lymph nodes from half of the group to normal male rabbits proved them infected in almost every instance demonstrating generalization of the syphilitic infection after intracorneal inoculation. All animals were treated with arsphenamine after the local lesion had subsided (160 and 275 days after the original inoculation). The rabbits were then reinoculated with the homologous strain of treponemes, both in the original cornea and also in the skin of the back.

The incidence of lesions developing in either cornea after reinoculation was higher than the incidence of lesions developing in the skin. The lesions developing in the corneas of the "immune" animals had a longer incubation period and were of shorter duration on the average than the lesions in the control group. No difference was noted in intensity of reaction.

Inoculation of the cornea of rabbits with syphilitic virus is often followed by the development of immunity to the homologous strain of organisms. This immunity is imparted to the skin to a greater extent than to either the cornea inoculated originally or the opposite uninoculated cornea. It persists after treatment with arsphenamine. It appears to be more marked the longer treatment is postponed.

In one half of all the test animals both cornea and skin were immune to a second inoculation of homologous syphilitic virus. In addition to these were five animals in which the cornea was immune and the skin nearly so. Thus in two thirds of the animals there developed a high degree of resistance

to reinoculation by a homologous strain of syphilitic virus following primary intracorneal inoculation.

Owen C. Dickson.

Chesney, A. M., and Woods, A. C. Further observations on the relation of the eye to immunity in experimental syphilis. 3. The influence of a non-specific inflammatory reaction in the cornea on the development of immunity in that tissue after intratesticular inoculation. *Jour. Exper. Med.*, 1944, v. 80, Nov. 1, p. 369.

Two experiments are reported in which rabbits originally inoculated with syphilis and treated late in the course of the disease (174th to 210th day) were reinoculated subsequently in both corneas with a homologous strain of syphilitic virus. In each animal one cornea was inoculated with dead tubercle bacilli prior to reinoculation with the syphilitic virus. This procedure was carried out in order to bring about a nonspecific inflammatory reaction with resultant vascularization, the intention being to find out if such vascularization would render the cornea more resistant to inoculation with the homologous strain of syphilitic virus. The results of both experiments were similar and while they were not conclusive, they indicated that there was a tendency for corneas which had been injected with dead tubercle bacilli to be more refractory to a subsequent inoculation with homologous syphilitic virus than the corneas of the same animals that had not been injected with dead tubercle bacilli. This tendency may be interpreted as suggestive evidence for the view that in the syphilitic rabbit there develop circulating antibodies toward the homologous strain of *T. pallidum*.

Owen C. Dickson.



Cockburn, Charles. A case of cornea plana. *Brit. Jour. Ophth.*, 1944, v. 28, Oct., pp. 486-488.

A case of cornea plana is reported and illustrated. The eyeballs were normal in size but the corneas were definitely smaller than normal and the corneoscleral junction was poorly defined. The curvature of the cornea was the same as that of the sclera. The condition is regarded as a hereditary defect probably transmitted as a mendelian recessive. (6 photographs, references.)  
Edna M. Reynolds.

Cogan, D. G., and Hirsch, E. O. The cornea. 7. Permeability to weak electrolytes. *Archives of Ophth.*, 1944, v. 32, Oct., p. 276. (See Section 2, Therapeutics and operations.)

Dimitry, T. J., and Azar, P. The use of choline in cases of ulcer and of leukoma of the cornea. *Amer. Jour. Ophth.*, 1945, v. 28, Jan., pp. 62-63.

Friedenwald, J., and Buschke, W. The effects of excitement, of epinephrine, and of sympathectomy on the mitotic activity of the corneal epithelium in rats. *Amer. Jour. Physiology*, 1944, v. 141, July 1, p. 689.

Excitement or annoyance of rats, particularly by painful stimuli, diminishes the mitotic rate in their corneal epithelium. The decrease of mitotic rate caused by excitement is an adrenergic response and can be simulated by local or systemic application of epinephrine. Both ergotamine and nicotine diminish the mitosis inhibition following excitement. The effect of epinephrine is not due to a decrease in tissue temperature or to local disturbances.

Removal of the cervical ganglion leads to a decreased mitotic rate in the

rat's corneal epithelium after a lag period of twenty hours. It is suggested that this effect is attributable to absence of some factor, other than sympathin, which regulates mitotic activity in this tissue under physiologic conditions, and that this manifestation of denervation may be related to that of sensitization.

Theodore M. Shapira.

Galton, E. M. G. Treatment of perforating corneal ulcer. *The Lancet*, 1944, v. 247, Aug. 26, p. 272.

Within a period of six months 15 cases of perforated corneal ulcer were seen and treated. Most of the cases were seen four to eight days after perforation and prolapse. Only three of the cases were free of trachoma. The remainder were usually in stage 3 or 4 of the disease. Patients were prepared for two days before operation by irrigation with mild antiseptics, and those with heavy infections were given sulfanilamide by mouth and as a local application.

At operation visor or double-visor flaps were used and the prolapsed iris excised. Little difficulty was encountered in freeing the iris tissue with spatulas in spite of the time interval. Sulfanilamide or acriflavine was instilled, and both eyes were kept covered for four days.

In every case the corneal ulcer healed and there were no septic complications. In the two literate cases the visual result was good. Vision in the illiterates could not be tested.

Owen C. Dickson.

Moehle, Walter. Corneal forceps: new type. *Amer. Jour. Ophth.*, 1945, v. 28, Feb., pp. 201-202. (One figure.)

Rados, Andrew. Epidemic keratoconjunctivitis and virus diseases of the

eye. Arch. of Ophth., 1944, Oct., pp. 308-329. (See Section 5, Conjunctiva.)

Von der Heydt, Robert. A clear corneal implant acquires dystrophy from its host. Trans. Amer. Acad. Ophth., and Otolaryng., 1943, 48th mtg., Nov.-Dec., pp. 59-61.

Authentic cases of invasion of clear corneal-tissue implants by dystrophy from their hosts are not on record. The author's patient, aged 52 years, has a granular disciform dystrophy on which a successful transplantation operation was performed six years ago, the vision at that time being 20/200. About four years ago a fine subsurface granular change was noticed in the center of the implant. This change has slowly progressed and now assumes the definite characteristics of the host's dystrophy. Vision is 20/50. (One figure, reference.) Charles A. Bahn.

Von der Heydt, Robert. Corneal dystrophies. Amer. Jour. Ophth., 1945, v. 28, Jan., pp. 55-57. (References.)

Wise, George. Keratoconus posticus circumscriptus. Amer. Jour. Ophth., 1944, v. 27, Dec., pp. 1406-1408. (One illustration, references.)

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Elliot, A. J. Gonorrheal iridocyclitis treated by penicillin. Canadian Med. Assoc. Jour., 1944, v. 51, p. 257.

The author presents a case of gonorrheal iridocyclitis successfully treated with penicillin by the iontophoresis method. Those treating the case, hospitalized five days before the onset of the ocular complication for acute gonorrheal urethritis and acute arthri-

tis, discontinued the use of sulfadiazine because it was ineffective and because of the appearance of casts in the urine. In addition to the iontophoresis, large doses of penicillin were given intravenously. The eye was cured but the arthritis remained unchanged.

Francis M. Crage.

Fralick, F. B. Rubeosis iridis diabetica. Amer. Jour. Ophth., 1945, v. 28, Feb., pp. 123-139. (One color plate, 17 photomicrographs, one table, references.)

Friedenwald, J. S. Dynamic factors in the formation and reabsorption of aqueous humor. Brit. Jour. Ophth., 1944, v. 28, Oct., pp. 503-510.

The problem of determining the factors responsible for the lack of complete equilibrium between blood and aqueous is approached by a detailed analysis of the secreting and re-absorbing mechanism of the eye. The articles by Kinsey, Grant, and Cogan (Amer. Jour. Ophth., 1942, v. 25, p. 760) and Duke-Elder and Davson (Amer. Jour. Ophth., 1944, v. 27, p. 307) on aqueous-humor dynamics are reviewed, and the author points out that his findings agree with those of Duke-Elder and his co-workers in regard to the constitution of the aqueous and with the findings of Kinsey and his co-workers in regard to the velocity of exchange between the blood and aqueous. (References.) Edna M. Reynolds.

Friedenwald, J. S., Hermann, H., and Moses, R. The distribution of certain oxidative enzymes in the ciliary body. Trans. Amer. Ophth. Soc., 1943, v. 41, pp. 141-156.

The authors have developed methods for isolation of the secretory portion of the ciliary body. They give details as

to dissection of the ciliary processes and removal of the epithelium. Techniques for identification of cytochrome oxidase in the epithelium and stroma are included. Cytochrome-oxidase activity was practically confined to the epithelium. The basal portion of the epithelium contained abundant cytochrome oxidase but was devoid of succinodehydrogenase. The authors therefore suggest that succinodehydrogenase is not part of the redox chain in the ciliary processes of the beef eye. (12 figures, 5 tables, references.)

Carl D. F. Jensen.

Green, M. I., and Jakobovits, J. Endophthalmitis subsiding after treatment with penicillin. *Amer. Jour. Opth.*, 1945, v. 28, Feb., pp. 191-193.

Harner, C. E., and Smith, J. G. Severe iridocyclitis treated with penicillin. *United States Naval Med. Bull.*, 1944, v. 43, Sept., p. 546.

A severe case of iridocyclitis healed promptly and completely after use of penicillin. Previously, under atropine, hot compresses, and intravenous typhoid injection, the condition had progressed alarmingly. R. Grunfeld.

Long, A. E. Chemotherapy in treatment of sympathetic ophthalmia. *Amer. Jour. Opth.*, 1945, v. 28, Feb., pp. 187-189. (References.)

Páez Allende, Francisco. Aniridia (congenital absence of the iris). *Arch. de Oft. de Buenos Aires*, 1942, v. 17, Dec., p. 744. (See *Amer. Jour. Opth.*, 1944, v. 27, July, p. 782.)

Ravin, L. C. Bilateral metastatic uveitis ending in phthisis bulbi as a complication of measles. *Arch. of Opth.*, 1944, v. 32, Oct., p. 301.

A three-year-old girl was seen following a severe episode of measles with associated bilateral otitis media and pneumonia. Sulfathiazole had been administered for three days prior to admission to the hospital. Examination revealed moderate lacrimation and photophobia with hyperemia of the conjunctivas. There was slight bilateral ciliary injection and turbidity of the aqueous. Complete annular posterior synechiae and pupillary membranes were present. Under atropine and sulfadiazine, the ciliary injection and photophobia gradually subsided. When examined five months after onset, each vitreous was a large pseudogliomatous mass through which the fundus could not be seen; and the globes were soft and moderately shrunken. There was no perception of light with either eye. (References.) John C. Long.

Sená, José A. Sympathetic serous uveitis. *Arch. de Oft. de Buenos Aires*, 1943, v. 18, Jan., p. 38.

The author reports two cases of the serous form of sympathetic ophthalmia which had a mild course and resulted in a complete cure under routine local treatment and the administration of mercury and neosalvarsan. The frequency of this form of sympathetic ophthalmia does not justify the bad prognosis usually applied to all cases of the disease. It is in the plastic form that the outlook is really dark. Aside from the importance of early diagnosis and institution of vigorous treatment, the mild course of serous sympathetic uveitis is due to lower virulence of the causal agent or a greater resistance of the individual. Preservation of the exciting eye in one of the cases leads the author to reaffirm his belief in prophylactic enucleation, but also to oppose therapeutic enucleation, except when

extensive involvement of the exciting eye threatens to make it painful or functionally useless. The literature on the subject is discussed, and a résumé of the cases of serous sympathetic ophthalmia published by Vogt is presented. (Photomicrographs, bibliography.)  
Plinio Montalván.

## 8

## GLAUCOMA AND OCULAR TENSION

Berens, C., and Nilson, E. Etiology of so-called chronic simple glaucoma. Possible role of focal infections, especially of the nasal accessory sinuses. *Trans. Amer. Acad. of Ophth. and Otolaryng.*, 1944, 48th mtg., Jan.-Feb., pp. 121-148.

The ipsilateral relationship between chronic simple glaucoma and nasal pathology apparently observed in several patients led to detailed study of 53 unselected cases of simple glaucoma which showed various indications of sinus infection and nasal pathology. Of these, 37 (79 per cent) either had unilateral glaucoma or showed more signs of glaucoma in one eye than the other, nasal involvement being greater on the ipsilateral side. In six cases, the glaucoma was bilateral and the sinus involvement was the same on both sides. In ten cases, the glaucoma was worse on the side with the lesser nasal involvement. In no instance were the glaucoma and the nasal involvement both limited to one side. The nasal bacteriologic findings were inconclusive. Among the possible causative factors mentioned are vasomotor disturbances caused by chronic hyperplasia of the sinuses, venous stasis, and bacterial sensitization. Thorough investigation of the upper respiratory tract and appropriate treatment are advised in patients with chronic simple glaucoma.

In discussion, Alan Woods doubted the existence of any noteworthy relationship between chronic simple glaucoma and sinus disease or nasal infection. Generally speaking, glaucoma is not benefited by eradication of nasal infection or radical operations on the sinuses. Otolaryngologists do not encounter simple glaucoma more frequently in patients with sinus disease and nasal infection than in any other similar group of patients. (One table, 10 figures, references.)

Charles A. Bahn.

Kravitz, Daniel. Carbaminoylcholine chloride in the treatment of glaucoma. *Arch. of Ophth.*, 1944, v. 32, Oct., pp. 283-286.

Carbaminoylcholine chloride is a sympathetic choline derivative which acts principally by inducing parasympathetic stimulation. Its action and chemical structure are similar to those of acetylcholine, but its effect is much more prolonged because of its slow rate of hydrolysis in the tissues. The absorption of carbaminoylcholine chloride is improved if the drug is prescribed in a wetting agent, such as zephiran, and if the eye is massaged through the lids after instillation. The drug has been of primary value in the treatment of chronic glaucoma, especially in cases which do not respond to pilocarpine or physostigmine. It is also useful as a replacement for miotics to which an intolerance has developed. Apparently a 0.75-percent solution of carbaminoylcholine chloride has slightly more effect than a 2-percent solution of pilocarpine nitrate and about the same effect as a 0.25-percent solution of physostigmine salicylate. The drug sometimes causes prolonged blurring of vision and occasionally pain.

The author reports the use of the drug in eight rather complicated cases of glaucoma. All types of glaucoma have responded to its use but good results have not been obtained in all cases. It is suggested that pilocarpine, physostigmine, mechoyl and neostigmine should first be tried and carbaminoylecholine chloride substituted if the previous response is not satisfactory. (References.) John C. Long.

Kronfeld, P. C., and McGarry, H. I. Results of surgical treatment of acute congestive glaucoma. *Quarterly Bull. Northwestern Univ. Med. School*, 1944, v. 18, no. 3, pp. 203-214.

The authors compare the results of various surgical procedures in use for the control of intraocular tension in acute congestive glaucoma. Iridectomy failed in 56, iris incarceration in 23, and corneoscleral trephining in 21 percent of cases. The remarkable failure of iridectomy was due to the presence of several-day-old, extensive, and unbreakable peripheral synechias, a view confirmed by clinical and gonioscopic observation. Iridectomy should, therefore, be used only in the very early stages of acute congestive glaucoma. Although both iris-inclusion and trephine operations were successful in a large number of cases, the best results in the hands of the writers were had, eight in succession, with basal iridectomy combined with small iris incarceration. A six-mm.-high conjunctival flap is made down to the limbus. After a scratch incision at the external scleral sulcus with a keratome (iridectomy ab externo) the prolapsed iris is excised by several small snips with the de Wecker scissors. In one corner of the wound, however, the iris prolapse is incarcerated by cutting the adjacent portion of the prolapse off its insertion

and crowding this portion of the iris into the angle of the wound. (3 tables, references.) R. Grunfeld.

## 9

## CRYSTALLINE LENS

·Bellows, J. G. Senile exfoliation of lens capsule. *Quarterly Bull. Northwestern Univ. Med. School*, 1944, v. 18, no. 3, pp. 232-237.

In connection with two case reports the author discusses the present theories relating to the formation of the capsular exfoliation, the probable cause of glaucoma capsulare, and the therapy of the condition. The two cases described had normal lenses (except for the exfoliated capsules), normal visual fields, and normal ocular tension. R. Grunfeld.

Perera, C. A. Congenital cataract following rubella in the mother. *Amer. Jour. Ophth.*, 1945, v. 28, Feb., p. 186. (References.)

Wolfe, O. R., and Mayer, L. L. Luxation of lens with voluntary control. *Amer. Jour. Ophth.*, 1945, v. 28, Feb., pp. 193-195. (2 figures.)

## 10

## RETINA AND VITREOUS

Esteban, Mario. Orientation for treatment of thrombosis of the retina. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, Jan.-Feb., pp. 106-114.

There are three aspects of thrombosis of the retinal veins upon which rational therapy is based. First, if a phlebitis is indicated, treatment should be directed toward the etiologic agent, syphilis, tuberculosis, or septic infection. For the latter the author considers the use of the sulfonamides of prime

importance, because by this means not only the primary focus is treated but also the local infection. Second, anticoagulants, such as heparin or leeches, should be resorted to early. Third, the slowed local circulation should be improved by local bleeding, as with leeches and massage.

J. Wesley McKinney.

Gans, J. A. Classification of the arteriosclerotic-hypertensive fundus oculi in patients treated with sympathectomy. *Arch. of Ophth.*, 1944, v. 32, Oct., pp. 267-275.

Eighteen hypertensive patients were treated by very extensive total or subtotal paravertebral sympathectomy including denervation of the retinal vessels by stellate ganglionectomy. The 15 patients that survived the operative procedure showed varying degrees of lowering of the blood pressure. A classification of fundus changes was devised to express separately the degree of arteriolar sclerosis and of acute hypertensive change. In the classification of arteriosclerosis, A 0 represented no sclerotic change in the fundi. Minimal signs of arteriolar sclerosis, such as widened arterial reflex, irregularity of lumen, and early crossing signs, were indicated as grade A 1. More advanced vascular changes were designated as grade A 2. Focal vascular insufficiency as evidenced by arterial closure or venous thrombosis with other signs of advanced vascular disease were graded as A 3. Absence of any acute hypertensive change was indicated as H 0. Edema of the nerve fibers, blurring of the disc, or preorganic vessel spasm was represented as H 1. The presence of hemorrhage or soft exudate was indicated as H 2, while measurable papillary elevation was designated as H 3. The fundi of 11 of the patients were

classified according to the A and H designations.

Fundus observations confirmed the beneficial effects of sympathectomy. Following the operations there was disappearance of hemorrhages, exudates, and papilledema. In the majority of cases, however, sympathectomy did not do away with vessel spasm and neural edema. The best results were obtained in patients with the least retinal arteriolar sclerosis. (7 tables, 3 figures, references.)  
John C. Long.

Gradle, H. S., and Sugar, H. S. Self-limitation of retinal separations. *Quarterly Bull. Northwestern Univ. Med. School*, 1944, v. 18, no. 3, pp. 174-183.

Nine cases of traumatic separation of the retina are described. In every case the lower portion of the retina was involved and in every case there was noted between the normal and separated retina a line of demarcation consisting of either diffusely pigmented chorioretinal scars or of retinal stripes, white lines bordered by pigment. The self-limitation must be considered as a favorable end result in untreated cases of traumatic retinal separation, and thus the prognosis is not entirely hopeless for those cases in which early operation is excluded on account of extensive hemorrhage into the vitreous. (One table, 10 figures, references.)

R. Grunfeld.

Hine, M. L. The end results of operation for detachment of the retina (with a follow-up of fifty successful cases). *Brit. Jour. Ophth.*, 1944, v. 28, Nov., pp. 575-585.

A full analysis of 120 cases of retinal detachment is given. Of this group, 50 cases were successful. All except five of these cases were followed for a year or more. Twenty of the cases had

secondary operations, three of which were successful. Thirteen cases had had previous detachment in the other eye. Four cases were aphakic and none of these was successful.

Myopic cases numbered 49. Of these, 17 were successful. Multiple holes were present in 18 cases. Of these 6 were successful. In 6 cases no hole or disinsertion could be found, but 4 of these eyes were aphakic. One of these cases was successfully operated upon. Age, in itself, does not determine the prognosis. There were an equal number of successful operations under 40 and over 40 years. The detachment of longest standing which was successfully operated upon was in a boy aged 13 years who had suffered an injury over two years previous to operation. The position of the retinal tear has no bearing on the success of the operation. The author stresses the importance of careful, repeated examination and carefully planned operative procedure. (One illustration.) Edna M. Reynolds.

Lawson, Arnold. *Scientific and clinical aspects of night vision*. Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 61-64.

The author takes up the physiologic basis of night vision, and some special problems related to night vision at sea. Experimentally, in a collaborated study with Russ, he tried to ascertain whether acuity of vision in dim light was related to variations in transparency of the eye to shortwave radiations within the range of normal vision. It was found that all nocturnal animals examined had a very marked transparency to radiations which were not at all transmitted through the human eye. In the human eye there seems to be a very considerable absorption of radiations within the range of normal

vision. It is definitely known that scotopic vision is carried out by the retinal rods, also that in nocturnal animals there are very few cones. The owl, which showed the greatest transparency of all the animals tested to short-wave radiations, hunts entirely by sight and without the aid of scent.

At the beginning of the war, men with good night vision for lookout work at sea were difficult to find, but the use of any adaptometer which secured a satisfactory estimate of the light threshold in the simplest and shortest way was of great help. The use of binoculars at night always tends to produce eyestrain, and the men often work in pairs so as to rest their eyes frequently. (One figure.)

Beulah Cushman.

Lijó Pavía, J. *Diathermic surgery of the retina*. Rev. Oto-Neuro-Oft., 1944, v. 19, July-Aug.-Sept., pp. 97-109.

In his cases of noninflammatory retinal detachment the author records a rather high percentage of satisfactory results—85 percent, if treated within two months of the onset. The major part of this paper deals with diathermic treatment of other retinal and choroidal conditions which predispose the eye to or cause detachment of the retina. Intraocular tumors, exclusive of choroidal cyst and iris melanoma, have responded to coagulation diathermy, with atrophy of the tumor and satisfactory retinal adhesions. One case of Coats's exudative retinitis responded to diathermy, with good cicatrization and the retention of some vision. Several cases of angiomatosis retinae have been helped.

The essay includes an excellent series of panoramic retinographs illustrative of one of the cases treated. Lijó Pavía argues that diathermy should no

longer be confined to cases of retinal detachment, but should be used also in the treatment of certain intraocular tumors, and in Hippel's and Coats's diseases.

Edward Saskin.

Livingston, P. C. *Scientific and clinical aspects of night vision*. Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 51-60.

The author describes the methods used to investigate the loss of rod sensitivity in anoxia acquired at the equivalent of 18,000 ft. altitude. Topics considered include aspects of the subject beyond the boundaries of physiology, and the two properties associated with scotopic vision which make its study significant; and use of a function of the retina in measuring a dysfunction of the body; and range of the perceptive power of the eye when daylight has gone. Night visual capacity embraces all associated reactions.

Another phase concerns the stages of night which can be divided into zones of cone-rod effectiveness. There is the sharp macular vision of cone derivation or nautical twilight, when cone and rod vision are balanced at an illumination in the region of 0.002 foot candles. This corresponds with that period of twilight when visual judgment is apt to become faulty. Beyond this stage, rod function predominates and visual processes become more settled. Further problems discussed involve scotopic examination of the central visual field. This showed characteristic features: (a) general enlargement of the blind spot with greater detail of contour; (b) a central scotoma; (c) a scotomatous area in the extreme upper field in 20 percent of the cases; (d) the presence of an area of heightened rod sensitivity in the form of a circle around the fixation point; (e) contraction of

the field if the luminosity of the test object was sufficiently reduced. Finally investigations showed that the rods were less resistant to oxygen deficiency than the cones. (5 figures, references.)

Beulah Cushman.

Marburg, Otto. *The endocrine glands in infantile amaurotic family idiocy*. Jour. Nervous and Mental Dis., 1944, v. 100, Nov., p. 450.

Tissue studies were made in three cases. The most striking change in the endocrine glands was a lack of adrenal medulla. Changes in the other glands were also noted. The work of numerous other investigators in this problem is referred to and discussed.

F. M. Crage.

Moreu, Angel. *Reflections on the problem of hemeralopic retinosis*. Arch. de la Soc. Oft. Hisp.-Amer., 1944, v. 4, Jan.-Feb., pp. 115-130.

This is an attempt to explain the basic pathology of hemeralopic retinosis (retinitis pigmentosa). From clinical and experimental studies which are cited the author postulates that the primary lesion (degeneration, infections, toxic, and so on) is located in the hypothalamus. (12 diagrams.)

J. Wesley McKinney.

Parsons, John. *Scientific and clinical aspects of night vision*. Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 64-66.

The author emphasizes the care necessary in regard to the adaptation curve, as threshold values should be measured under similar and comparable conditions. The physicist and physiologist are at variance as to the particular range where both rods and cones function. In the problem of night flying, moonlight gives a rod-and-cone



combination, but the transition from moonlight to starlight results in a practically complete scotopic condition in which vision is very bad. From the point of view of practical tests for flying and for conditions in darkness there must be fundamentally a reasonably good dark-adaptation curve, but superimposed on that there is a highly complex state of affairs in which form vision and intelligence are involved with a host of other things.

Beulah Cushman.

Pickard, Ransom. Scientific and clinical aspects of night vision. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 68-69.

The author speaks of the need for adoption of a standard area of stimulation, and an instrument to provide for estimation of an adaptation curve, the final result being given as light value for a given area. Beulah Cushman.

Pollak, H. Some metabolic and nutritional factors affecting dark adaptation in peptic-ulcer patients. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 69-74.

More recent observations have shown little correlation between the photometric readings and vitamin-A intake with impairment of dark adaptation, but a much closer relation to some metabolic inefficiency due to ill health. Dark adaptation on the whole may be the index of liver function rather than of vitamin-A intake.

The author's study of dark adaptation in patients with peptic ulcer showed that the degree of abnormality bore some relation to deterioration in general condition. He feels that failure in dark adaptation can not be explained by inadequate vitamin-A intake but rather by hepatic dysfunction and dis-

turbances in vegetative control. Therapy to improve liver function was used in the form of ascorbic acid, aneurin, nicotinic acid, and other factors of the vitamin-B complex in yeast and liver extract; and with it there were indications of a trend toward normality of dark adaptation. (One figure, references.) Beulah Cushman.

Riddell, W. J. B. Scientific and clinical aspects of night vision. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 43-50.

The author states that night vision involves the whole visual pathway from the corneal epithelium to the visual cortex, also that the psychology of the person to be examined and that of the examiner must be taken into account.

All tests must reckon with the intensity and duration of the light, the size of the test-patch area of the retina stimulated, the color of the light, and the duration of the exposure. A standard exposure of the patient before the test is also necessary.

Most patients who complain of difficulty in dull light have no objective symptoms, but anxiety states can usually be placed first as etiologic factors, followed in order of importance by visible pathologic retinal changes, errors of refraction, hereditary night blindness, hysteria, and dietary deficiency. (2 figures, references.)

Beulah Cushman.

Robertson, G. W., and Yudkin, J. Studies in dark adaptation as a means of detecting deficiency of vitamin A. *Brit. Jour. Ophth.*, 1944, v. 28, Nov., pp. 556-568.

Studies of dark adaptation of various groups (1,500 subjects) as a means of detecting deficiency of vitamin A are reported. Because of the effects of age

on dark adaptation; the results are presented in three parts. First, groups of children from 9 to 12 years are compared; then, groups of young adults from 15 to 22 years; lastly, subjects over 22 years.

Children from three Cambridge schools were compared with children in a village school. The diet of the children in the village school might have been expected to be higher in vitamin A than that of the children in the city schools, but the children in the village school showed significantly poorer dark adaptation than the children in the Cambridge schools. Although the Cambridge school children represented various economic levels, they showed no appreciable difference in dark adaptation.

The group of young adults was made up of men and women college students and nurses and Birmingham factory workers. The nurses and college students were equally good in dark adaptation and all were better than the two groups of factory workers.

The older group of subjects was made up of Cambridge nurses and Sheffield workers. These were compared with the Birmingham factory workers. The dark adaptation of the Sheffield workers was about the same as that of the Birmingham workers, while that of the nurses was better than either group of factory workers.

A group of 14 laboratory workers received supplements of vitamin A (24,000 I.N.) or half a pound of carrots (about 20,000 I.N. carotene) daily. Six of these showed definite improvement in dark adaptation after a three weeks interval.

Birmingham factory workers who received a daily supplement of 5,000 I.N. vitamin A, 1 mg. vitamin B<sub>1</sub>, 25 mg. vitamin C, and 500 I.N. vitamin D for

a period of eight months showed a significant improvement in dark adaptation, while the group which did not take the vitamin supplement showed no appreciable alteration in dark adaptation. Vitamin supplements given at three of the Cambridge schools produced no alteration in dark adaptation. (3 tables, 4 figures, references.)

Edna M. Reynolds.

Rosen, Emanuel. Photographs of retinal detachment in aphakia, before and after operation. *Brit. Jour. Ophth.*, 1944, v. 28, Nov., pp. 554-556.

Rosen reports a case of successful operation for retinal detachment in an aphakic eye in a patient aged 61 years with a mild grade of diabetes associated with marked hypertension. The vision in the operated eye with correction has remained at 20/25 for three years. (2 fundus photographs, 2 visual-field charts.)

Edna M. Reynolds.

Wright, W. D. Scientific and clinical aspects of night vision. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 66-67.

The author advocates that greater attention be paid to the phenomena which occur after cessation of preadaptation, which may be the most exciting part of the adaptation curve. Some observers show recovery of sensitivity immediately when light adaptation ceases, while in others there may be a delay of twenty seconds before any recovery is recorded. The explanation of adaptation phenomena in terms merely of visual-purple regeneration is not adequate. Measurements on the luminosity curve at various intensity levels indicate, from persistence of the Purkinje shift, that the rods continue to function at high levels of illumination.

Beulah Cushman.

## 12

## VISUAL TRACTS AND CENTERS

Salgado Benavides, Enrique. Tumors of the cerebellopontine angle. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, Jan.-Feb., pp. 75-95.

The author reports two cases, with a discussion of the symptomatology and diagnosis of such tumors.

J. Wesley McKinney.

## 13

## EYEBALL AND ORBIT

Brain, W. R. Thyrotoxicosis in relation to ophthalmology. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 3-8.

The author considers the significance of the three main symptoms in thyrotoxicosis: exophthalmos, lid changes, and ophthalmoplegia. He describes the clinical syndromes in which these may be combined, and some lines of surgical and medicinal treatment. (2 tables, references.)

Beulah Cushman.

Jackson, Harvey. Thyrotoxicosis in relation to ophthalmology. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 39-40.

The author makes a plea for diagnostic caution in cases of unilateral exophthalmos, as in his experience several cases labeled as of thyrotoxic origin were proved finally to depend upon orbital tumor. The use of X rays and visual fields may be of great help with the general findings of thyrotoxicosis.

Beulah Cushman.

Moffatt, P. McG. Thyrotoxicosis in relation to ophthalmology. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 19-21.

Six days after admission to the hos-

pital of a woman of 45 years with bilateral exophthalmos, a transfrontal decompression of the right orbit was done, as the right exposed cornea was in good condition. The cornea cleared during the operation, and the proptosis was reduced considerably. Bilateral tarsorrhaphy was done, but the adhesions broke down within 12 days and the left eye had to be eviscerated.

Tarsorrhaphy was repeated on the right lids nine days later, but again broke down by the end of the week. Six doses of deep X-ray therapy were given to the pituitary gland, but caused severe headache. Ulceration of the lower third of the right cornea did not improve. Iodine therapy had no effect. Partial thyroidectomy was performed six weeks later and the patient made a good recovery, but the eye remained the same. One month later the ulcer seemed safe and the patient went home. She began to develop attacks of depression and delusions of persecution.

Two months later, further measures seemed necessary to keep the eye safe, and a decompression of the lateral walls of the orbit was done. Following this there was further reduction in the proptosis and chemosis and the corneal ulcer healed. The final vision was 6/18. The author concludes that transfrontal decompression of the orbit and other procedures should be done as soon as it is realized that minor measures are not sufficient. (One photograph.)

Beulah Cushman.

Mulvaney, J. H. Thyrotoxicosis in relation to ophthalmology. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 22-38.

For the differentiation of exophthalmos the author presents the following classification as a working basis: (1) the hyperthyroid complex to include

thyrotrophic hyperthyroidism depending on pituitary control, of which familiar examples are found in the last third of pregnancy or in acromegaly; (2) thyrotoxicosis (Graves's or Basedow's disease and exophthalmic goiter), a compound expression of hyperthyroidism and sympathicotonia apparently maintained independently of thyrotrophic stimulation; (3) thyropathic hyperthyroidism, a result of abnormal structural alterations in the thyroid gland usually transient in nature and exemplified in certain instances of early neoplasm, lymphadenoid goiter, and inflammation.

Mulvaney feels that the proptotic mechanism is a forward traction on the globe induced by spasm of the anterior orbital unstriated musculature acting in the presence of weakened voluntary extraocular muscles. These include the upper and lower palpebral muscles of Müller and the circular muscle of Landström. The weakness of voluntary muscles is probably due to thyrotoxic myasthenia and to suppression or excessive destruction of acetylcholine at the myoneural junction, and to atonia from local neuromuscular degeneration. The pathologic changes in the muscles vary according to the different types, each of which the author analyzes at length. (8 illustrations, references.)

Beulah Cushman.

Savin, L. H. Thyrotoxicosis in relation to ophthalmology. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 9-18.

Many patients with early thyrotoxicosis may come first to the eye physician with complex symptoms of asthenopia out of proportion to the ocular findings, the symptoms resembling an anxiety neurosis, and all symptoms being exaggerated by any emotional dis-

turbance. An abrupt manner, dilated pupils, slightly widened palpebral fissures upon excitement may make one suspicious of thyrotoxicosis.

Efficient premedication should be used before any operative procedure, and the eyes should be protected with vaseline pads at all times. Complete tarsorrhaphy should be done early, combined if necessary with lateral tarsorrhaphy for persistent mild degree of exophthalmos. (2 figures, 2 tables, references.)

Beulah Cushman.

Wright, R. E. Plastic spheres for implantation into Tenon's capsule in the Frost-Lang-type operation for enucleation of the eyeball. *Brit. Jour. Ophth.*, 1944, v. 28, Nov., pp. 573-574.

Methyl-methacrylate-resin spheres perforated in two diameters at right angles and fluted on the surface in a basket-work pattern are recommended as implants following enucleation of the eyeball. The spheres are anchored by catgut sutures to the superior and inferior recti through the vertical tunnel and to the lateral and medial recti through the horizontal tunnel. The sutures are tied over the top of the globe. The fluting of the globe is intended to supplement the fibrous tissue anchorage which eventually takes place. (3 illustrations.)

Edna M. Reynolds.

## 14

### EYELIDS AND LACRIMAL APPARATUS

Beiras García, Antonio. Contribution to the surgery of the lacrimal passages—"lacrhorhinoplasty." *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, Jan.-Feb., pp. 26-32.

The operation proposed, and carried out in three cases, is as follows: The skin is incised as for dacryocystorhi-

nostomy. The tear sac is extirpated, if present. A large opening is made into the nose, preserving the nasal mucosa. A vertical incision is made in the nasal mucosa forming a large anterior flap and short posterior flap. The internal canthus is retracted nasalward with a two-pronged hook. Using a large keratome, a curved vertical incision is made immediately behind the caruncle, with its concavity backward, and the incision is carried into the lacrimal fossa between the two branches of the internal palpebral ligament. The posterior flap of nasal mucosa is sutured directly to the conjunctiva if this can be accomplished without too much tension. If not, a graft of buccal mucous membrane 8 to 9 mm. wide is interposed. The anterior flap of the nasal mucosa is sutured to the anterior lip of the conjunctival wound. Here again, if there is too much tension a buccal-mucous-membrane graft is interposed. Thus, two epithelial surfaces face each other. The ligament is sutured and the skin incision closed. The operation is completed by inserting in the new-formed canal a metallic cylinder 5 mm. in diameter and 14 mm. long. One of the posterior conjunctival-graft sutures is left long and tied through a hole in the ocular end of the metal tube to hold it in place. The posterior lip of the ocular end of the tube is bent forward to prevent its rubbing the globe. The tube is removed in eight to ten days. In two of the three cases reported a permanently patent passage resulted. (3 figures.)

J. Wesley McKinney.

Belmonte González, Nicolás. **Lacryorhinostomy.** Arch. de la Soc. Oft. Hisp.-Amer., 1944, v. 4, Jan.-Feb., pp. 33-36.

A tubular tunnel is made between the lacus lacrimalis and the nose, and is

lined anteriorly with a flap of conjunctiva and posteriorly with a flap of nasal mucosa. In two of the three cases reported, the tunnel became completely closed. In the third, the result was described as only partially successful. (2 color plates.) J. Wesley McKinney.

Lorente Buesa, Marcelo. **Hemorrhage in dacryocystorhinostomy, its prophylaxis and treatment.** Arch. de la Soc. Oft. Hisp.-Amer., 1944, v. 4, Jan.-Feb., pp. 48-58.

The principal and most feared complication of dacryocystorhinostomy is hemorrhage. No case should be operated upon unless the coagulation and bleeding time are normal. The bony opening should be made as high and as far forward as possible in order to avoid the ethmoid cells and the erectile tissue of the middle turbinate. No part of the nasal mucosa should be left without sutures. Effective postoperative care is very difficult in the presence of severe hemorrhage.

J. Wesley McKinney.

Marín Amat, Manuel. **Problems which dacryocystorhinostomy poses.** Arch. de la Soc. Oft. Hisp.-Amer., 1944, v. 4, Jan.-Feb., pp. 37-47.

In the author's opinion secondary hemorrhage is the complication of dacryocystorhinostomy most to be feared. It arises principally from the vertically coursing blood vessels, which are cut by the horizontal incisions used in making the flaps of nasal mucous membrane. The author discusses this incision and he questions its wisdom. Three cases of failure of the operation are recorded; all of which were reoperated. In each case return of epiphora was due to closure of the nasal opening by adherence of the posterior flap to the anterior. The operation of Ar-

ruga for reestablishing drainage into the nose after extirpation of the tear sac is described, and the author's technique of dacryocystorhinostomy is given. (10 figures.)

J. Wesley McKinney.

## 15

### TUMORS

Basterra, Jesús. Cholesteatoma of the orbit. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, Jan.-Feb., pp. 66-71.

There had been considerable erosion of the roof of the orbit. At operation the cholesteatomatous mass was found between the periorbita and the bone. There was no apparent capsule. It is postulated that the condition is due to embryonic rests of ectodermal origin. (4 figures, references.)

J. Wesley McKinney.

Costi, Carlos. Recurrent glioma treated by the radiotherapy of Chaoul. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, Jan.-Feb., pp. 72-74.

Local recurrence of glioma was treated with 8000 R. in fractional doses. The tumor disappeared completely, only to return within three months.

J. Wesley McKinney.

Cumings, J. N., and Sorsby, A. Unilateral and bilateral retinoblastoma—a possible histological difference. *Brit. Jour. Ophth.*, 1944, v. 28, Nov., pp. 533-637.

Histologic studies of 19 cases of retinoblastoma from the Royal Eye Hospital are reported. Eight of the tumors were unilateral, eight bilateral, and three hereditary. The unilateral tumors all showed fairly solid arrangement of cells, except one which tended to grow in a papillomatous manner. Little fibrous-tissue stroma was to be seen,

but blood vessels were fairly prominent. Necrosis was common, with polymorphonuclear infiltration. The cells composing the tumor were small, with the nucleus almost filling the cell. Mitoses were not very common. In each case it was possible to make out the passage from normal retina to tumor. This change took place gradually in most cases, and the tumor could be seen arising from the outer nuclear layer, with portions of the inner nuclear layer covering the tumor and gradually thinning out until it disappeared entirely. Three of the cases had multiple tumor-nodules.

The bilateral tumors showed the same general arrangement of cells, which tended to be somewhat larger and to contain more cytoplasm. Mitoses were no more common than in the unilateral tumors. Some of the tumors were multiple, as in the unilateral group, but, in contrast with the unilateral cases, all the bilateral tumors appeared to arise either from the inner nuclear layer only or from both nuclear layers. In no case did the tumor originate from the outer nuclear layer only.

The familial tumors resembled the bilateral type microscopically. Neuroglial fibers were not found in any of the tumors, and in only one case was reticulin demonstrated. In this case, it appeared to be derived from the wall of the orbit. The three hereditary tumors were bilateral and did not appear to differ from the sporadic bilateral type. (One table, 4 figures.)

Edna M. Reynolds.

Keyes, J. E. L., and Queen, F. B. Tricho-epithelioma of eyelid. *Amer. Jour. Ophth.*, 1945, v. 28, Feb., pp. 189-191. (2 figures, references.)

Pérez-Buñill. Malignant palpebral tumors. *Arch. de la Soc. Oft. Hisp.-*

Amer., 1944, v. 4, Jan.-Feb., pp. 59-65.

The author counsels excision of all malignant tumors of the lids. The plastic procedures carried out in five cases are described. (13 figures, references.)

J. Wesley McKinney.

## 16

### INJURIES

Biram, J. H., and Barton, P. N. Vision and accident repeaters. *Indust. Med.*, 1944, v. 13, Sept., p. 683. (See Section 18, Hygiene, sociology, education, and history.)

Ridley, Harold. Snake-venom ophthalmia. *Brit. Jour. Ophth.*, 1944, v. 28, Nov., pp. 568-572.

A description of varieties of spitting snakes is given and a case of snake-venom ophthalmia is reported. The interesting features of the case were corneal anesthesia persisting five to seven days and abnormal epithelial regeneration.

The author recommends further experiments with cobra toxins with a view to obtaining a substance producing prolonged anesthesia of the anterior segment of the eye. (References.)

Edna M. Reynolds.

Sheppard, L. B. Report of an eye injured by lightning. *Amer. Jour. Ophth.*,

1945, v. 28, Feb., pp. 195-198. (4 figures, references.)

## 17

### SYSTEMIC DISEASES AND PARASITES

Fornes Peris, Enrique. Histopathology of an eye affected with cysticercus. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, Jan.-Feb., pp. 98-105.

This is a complete pathologic report on an eye enucleated because of continued painful endophthalmitis. Electrocoagulation had been done two years previously in an attempt to destroy a cysticercus in the vitreous. All the structures of the eye with the exception of the cornea and sclera showed evidence of chronic inflammation. In the anterior vitreous was a large mass to which the lens and detached retina were adherent, and which microscopically resembled granulation tissue infiltrated with lymphocytes and polynuclears. In front of this mass was the cellular cysticercus, larval form of *tenia solium*, with the characteristic hooks of the cestode. The cysticercus had evidently been dead for some time, as it was infiltrated with calcium. But it could not be determined whether the cysticercus had died as a result of the electrocoagulation or from strangulation by the reactional mass. (4 photomicrographs, references.)

J. Wesley McKinney.

# NEWS ITEMS

Edited by DR. DONALD J. LYLE  
904 Carew Tower, Cincinnati 2

News items should reach the editor by the twelfth of the month

## DEATHS

Dr. Ellice M. Alger, New York, New York, died February 18, 1945, aged 75 years.

Dr. Charles R. Blake, Richmond, California, died December 26, 1944, aged 76 years.

Dr. Robert I. Bullard, Springfield, Illinois, died December 25, 1944, aged 67 years.

Dr. Belton D. Caughman, Columbia, South Carolina, died November 30, 1944, aged 59 years.

Dr. James W. Fleming, Utica, New York, died January 21, 1945, aged 63 years.

Dr. George S. Munson, Albany, New York, died December 9, 1944, aged 88 years.

Dr. Nicholas J. Scarito, Lawrence, Massachusetts, died December 3, 1944, aged 65 years.

Dr. Arthur E. Smith, Minneapolis, Minnesota, died February 16, 1945, aged 65 years.

Dr. Mark J. Schoenberg, New York, New York, died February 15, 1945, aged 70 years.

Dr. Frederick G. Thayer, Medford, Oregon, died November 14, 1944, aged 63 years.

Dr. F. Carlton Thomas, Lexington, Kentucky, died December 2, 1944, aged 49 years.

Dr. Willis C. Trowbridge, Goldendale, Washington, died November 20, 1944, aged 71 years.

Dr. Thomas F. Wickliffe, Jasper, Alabama, died November 26, 1944, aged 64 years.

## MISCELLANEOUS

Emory University has postponed the ophthalmologic seminar, which had been scheduled for April 19th to 21st, on advice from the War Committee on Conventions.

The next examination by the American Orthoptic Council will be held in September-October, 1945.

The written examinations will be held at various cities in the country on Friday, September 7, 1945. Only those passing the written examinations will be permitted to take the oral and practical tests, to be given in Chicago, Saturday, October 6, 1945.

Applications on official forms must be received before July 1, 1945.

Address the American Orthoptic Council, 23 East 79th Street, New York 21, New York.

The nineteenth semi-annual Wood's course in refraction will be held by Drs. Ralph H. Woods and Aubrey H. Pember and associates, April 29th to May 4th, inclusive, at Pember-Nazum Clinic, Janesville, Wisconsin. The fee is \$75.00. Registration is limited. For further information please address Dr. A. H. Pember,

500 W. Milwaukee Street, Janesville, Wisconsin.

## SOCIETIES

At the February dinner meeting of the Cleveland Ophthalmological Club the guest speaker was Dr. A. D. Prangen of the Mayo Clinic, who spoke on "Some aspects of refraction." Dr. L. V. Johnson, Cleveland, gave a review of his work on ocular toxoplasmosis.

At the meeting of the Washington, D.C., Ophthalmological Society, held on March 5, 1945, the guest speaker was Col. Derrick Vail (MC), who spoke on "War ophthalmology." Dr. Benjamin Rones reported a case of "Anomalous vascular loop in the macula." The following case presentations were made: "Juvenile disciform degeneration of the macula" by Dr. Joseph Dessoiff; "Foreign body puncturing soft tissues of the orbit and extending into the brain" by Dr. Thomas Rees; "Anterior capsular cataract due to trauma" by Dr. Frank D. Costenbader; and "Corneal striae" by Dr. Benjamin Rones.

At its meeting on January 17, 1945, the Reading Eye, Ear, Nose, and Throat Society sponsored the organization of the Diplomates' Association of Physicians of Berks County. All diplomates of Boards, listed in the Directory of Medical Specialists, have been invited to join. A joint meeting with the Reading Eye, Ear, Nose, and Throat Society will be held once a year. At this first joint meeting, Dr. Harrison F. Flippin of Philadelphia spoke on "The clinical use of penicillin."

## PERSONALS

Col. Derrick Vail has been appointed Professor of Ophthalmology and Head of the Department at Northwestern University, and will assume the duties on his release from the Army. Colonel Vail's present address (correction of the notice in the March issue) is:

Col. Derrick T. Vail (MC) 0491780

Office of the Surgeon General  
Room 507 C

1818 H St. N.W., Washington 25, D.C.

Lt. Col. M. E. Randolph, formerly Chief, Branch of Ophthalmology, Surgical Consultants Division, Surgeon General's Office, has been assigned to Valley Forge General Hospital as Chief of the E.E.N.T. Division. He replaces Lt. Col. James N. Greear, who has recently sailed overseas, assigned as Senior Consultant in Ophthalmology to the Chief Surgeon, European Theater of Operations.



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## DIRECT UTILIZATION OF THE EYE AS A CAMERA\*

WILLIAM A. MANN, M.D.

Chicago

(With the collaboration of RALPH CREER, CAPT., U.S.A., formerly of the Department of Clinical Photography, U. S. Veterans' Hospital, Hines, Illinois)

It is generally recognized that Christopher Scheiner, the Jesuit philosopher, was the first to demonstrate the actual formation of an inverted image upon the retina by making a window at the posterior pole of the eye. Although the date of this experiment is generally given as 1619,<sup>1</sup> (the date of publication of his "*Oculus hoc est*," according to Von Rohr, who has translated Scheiner's works from Latin into German) Scheiner did not report this actual demonstration upon the eyes of animals until publication of his "*Rosa Ursina*" in 1925.<sup>2,3</sup> Scheiner's original monographs were unobtainable by the essayist for verification.

The camera obscura had been invented long before Scheiner's investigations and has been credited to Giambattista della Porta (1545-1615), although Leonardo da Vinci and Don Pronince<sup>4</sup> may have antedated Porta, and Polyak finds evidence that its principle was known to the ancient Greeks.<sup>5</sup> In spite of the obvious comparison of the eye to the camera obscura there was considerable reluctance, both before and after Scheiner's momentous contribution, to accept as a fact the inversion of the retinal image, a premise

which had first been evolved upon theoretical grounds by Kepler in 1611.<sup>6</sup>

Prior to Joannes Kepler's monumental contributions as a pioneer in physiologic optics there had been no clear idea of the mechanism of the formation of the retinal image, and, in fact, little advance from the early Galenic hypothesis of the lens as the receptor of visual impulses. Following the publication of Scheiner's classic experiment numerous investigators corroborated his findings, which have become, especially when performed with an albinotic eye, a standard laboratory demonstration in physiologic optics. In 1638 Rene Descartes removed the posterior wall of the eye and replaced the retina with the flat surface of another object, upon which the image was observed.<sup>5</sup>

Finally in 1877, Kühne,<sup>7</sup> in carrying out extensive studies on visual purple, produced his famous "optograms," which led to the popular fallacy (still persisting) of the face of the murderer being observed on the retina of the victim. What Kühne did accomplish was to produce an image on the retina by prolonged exposure, light causing a change in the rhodopsin which could be observed grossly for a short time. Using albinotic rabbits, eyes of birds, or, in some cases, eyes with a thin sclera and only moderate choroidal pigmentation, he brought the

\*From the Department of Ophthalmology of Northwestern University Medical School. Candidate's thesis for membership in the American Ophthalmological Society, June, 1944.

image (usually a flame, but in some cases a large photographic negative held against the sky) to a focus on the retina as exactly as possible by observation of the sclera (as a ground glass) at the posterior pole of the eye. The animal had first been dark-adapted for 15 minutes, decapitated, and the eye enucleated under a sodium light. After exposure, the duration of which he varied but which usually was for several hours, the eyes were placed in 4 percent aluminum potassium-sulfate solution for 24 hours in the dark. The purpose of the alum solution was to make the subsequent removal and inversion of the retina more readily accomplished and *did not serve to fix the image*, as had been widely misquoted but emphatically denied by the author himself. He was not successful in "fixing" the image chemically in a photographic sense, but after the retina was inverted by punching out the optic nerve and removing the retina under water, he could observe the optogram in the floated retina for as long as 30 minutes and if the retina were then dried in a desiccator the image persisted for a much longer period. The image of the flame was well reproduced, but more complicated subjects, such as the photograph of a man, did not show details well.

In 1926 Hidano<sup>8</sup> photographed for the first time the image formed by the eye. He constructed an apparatus consisting primarily of a metal tube 35 mm. in diameter with a circular opening in the base 12 mm. in diameter. Into this the freshly enucleated eye of a dog was placed with the cornea protruding through the opening. Plaster of Paris was placed around the eye to hold it in position and a large window was made at the posterior pole of the eye, by removing the sclera, choroid, and retina. Behind the eye was a closed chamber with a piece of glass at the back and an ingenious device connected with a mercury manometer by

which the intraocular pressure could be controlled through use of Ringer's solution in the chamber. The cornea was also protected by a chamber containing Ringer's solution. He found that if the tension were not controlled the globe would collapse and if the cornea were not protected it would become clouded. By using a mirror at a 45-degree angle behind the apparatus and a photographic camera in the proper position, the image formed by the eye was reflected by the mirror into the camera, and it was possible to obtain quite clear photographs with a resulting magnification of about three times. These photographs gave no information as to the refraction of the eye, as a clear picture could be obtained whether the image was formed in the vitreous, the normal position of the retina, or even behind the globe. In a subsequent experiment<sup>9</sup> he inserted a screen in the normal position of the retina, photographing the image on the screen with various lenses placed in front of the eye. A thin layer of paraffin was placed between two cover glasses to form this screen, which was arranged so that it could be moved forward or backward by means of a screw. This screen meant that, departing from the method of his first experiments, he was now photographing the image approximately as it would be formed *on the retina*.

Lashley<sup>10</sup> in 1932, photographed the image in albino rats' eyes, the sclera of the undissected eye being used as a screen upon which the image was formed. The eyes were kept in a moist chamber throughout the experiment, and it was found that good transparency could be maintained for as long as 30 minutes.

Since the invention and development of the modern camera, with its almost universal use throughout the civilized world and the wide understanding of its general principles, the comparison between

the photographic camera and the eye has naturally and repeatedly been made, especially when attempting to describe the function of the eye to the general public.<sup>11</sup> Verbitzky<sup>4</sup> has even calibrated the relative apertures of the schematic eye in terms of photographic lenses as  $f/6$ ,  $f/4$ , and  $f/12$  for pupils of 4 mm., 6 mm., and 2 mm., respectively.

In spite of this frequent comparison of the eye to a modern photographic camera and the retina to the sensitized emulsion on the photographic plate or film, a thorough study of the literature does not reveal any evidence that any investigator has ever attempted to *substitute* such film for the retina and thus actually utilize the eye as a camera. While Hidano, Lashley, and possibly others have photographed the retinal image as previously described, they made use of a camera for that purpose and in no case registered the image on sensitized photographic emulsion placed within the eye itself.

In contemplating the possibilities of direct utilization of the eye as a camera certain difficulties are at once suggested. It is self-evident that all media must remain as transparent as possible. Post-mortem changes are especially apt to cause corneal clouding, particularly if the epithelium becomes dry for too long a period of time. Reduction of intraocular pressure incidental to opening the globe may further contribute to loss of transparency. These factors Hidano felt it necessary to overcome to maintain ocular transparency, and to that end he constructed the somewhat complicated apparatus already described. Eyes should be used as soon after enucleation as possible, and if any appreciable time interval elapses it would seem desirable that precautions be used to keep the tissues as well preserved as possible to avoid more than minimal post-mortem changes. Since the globe must be opened posteriorly to

admit the photographic film (which because of its pliability would seem more suitable than a plate) every effort must be made to prevent vitreous loss, and some method would have to be employed to assure that the film was placed in the proper position, comparable to that normally occupied by the retina. Since the image will be small (not enlarged by the process of photography as in Hidano's experiments) it is desirable to utilize a very fine-grain photographic emulsion. Mees<sup>12</sup> has emphasized the fact that since the photographic image consists of grains, no matter how sharp the edge of the theoretical image which produced it may be, it will appear more or less ragged under high magnification. The resolving power of an emulsion is the product of three factors—graininess, turbidity, and contrast—giving a very complex reaction. Therefore, no matter how fine-grained an emulsion is used, it is not to be expected that it will be possible to obtain too clear a positive print if one attempts to enlarge a negative with an image in any way approaching the small size of the macular image. It is consequently to be expected that an area much larger than the macula must be utilized.

With these difficulties anticipated, an attempt was made to substitute photographic film for the retina in the eyes of various animals, and to obtain on that film photographic images by utilizing the eye as a camera. In the series of experiments conducted, the eyes of pigs, sheep, beeves, cats, and rabbits were employed. The first three were obtained fresh from the Chicago stockyards, the latter two were from laboratory animals, the eyes being enucleated just prior to the experimental procedures. It was found that sheep's eyes were the most satisfactory for this work; they approximate the human eye anatomically (although they are larger in all dimensions, averaging 28 mm. in length),

the media remain clear, and the vitreous is not so fluid as that of rabbits or cats. Beef eyes were too large for satisfactory comparison to the human eye, and pigs' corneas tend to become clouded, for the animals are sprayed with an anti-septic solution before being slaughtered, in accordance with U. S. Government reg-

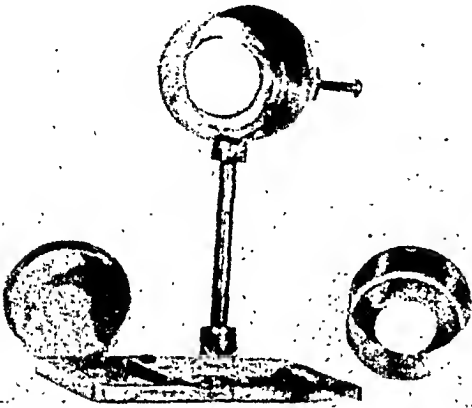


Fig. 1 (Mann). Apparatus for holding eye. Shows outer tube mounted in stand (center); inner cup for eye with optical glass in back (lower right); and metal cap (lower left).

ulations. All eyes from the stockyards were used as soon as possible, but there was of necessity an interval of several hours between the time of their removal and their use in the laboratory. Immediately upon receipt from the slaughterhouse they were placed, wrapped as delivered, in a refrigerator with the temperature set at 5°C. With these precautions the media remained grossly quite clear and a very clear view of the fundus could be obtained with the ophthalmoscope.

The first attempts to obtain a photographic image were made by simply placing a strip of unexposed film in front of the retina. Two parallel incisions, about 4 mm. long and about 3 mm. on either side of the estimated position of the macula, were made through the sclera, choroid, and retina. Working in the dark with only a photographic safety lamp, the

writer placed a strip of film 4 mm. wide through one incision, across in front of the retina, and out the other incision. The film was then pressed forward slightly on the lateral side of each incision to make it fit snugly against the retina and conform to its curvature. This was accomplished without appreciable loss of vitreous. The whole posterior segment of the eye was then covered with a dark cloth to eliminate extraneous light and an attempt was made to photograph a visual-acuity chart about 17 feet away, using a flashlight bulb. A very fast film, Super XX, was employed. In spite of repeated attempts along this line and the use of various exposure times, no image was obtained on the film. Only a black spot was recorded, showing that the portion of the film within the eye had been exposed to light.

It was realized that in this crude original effort no attempt had been made to get the image into focus and that if the eye were other than perfectly emmetropic with relaxed accommodation in this post-mortem state one could not hope for a clear retinal (or photographic) image, without the use of a ground glass for focusing.

With the assistance of Mr. Hunter of the Belgard-Spero Optical Company, a metal container was constructed to hold the eye (fig. 1). This consisted of a piece of brass tubing 26 mm. long and 46 mm. in diameter, the front end open and the back end containing an opening in the brass 23 mm. in diameter, into which was cemented a piece of very thin optical glass, curved as nearly as possible to the posterior conformity of the globe. This inner cup for holding the eye was fitted snugly into a slightly larger piece of brass tubing with an open front and a circular opening in the back 28 mm. in diameter, and mounted on a standard to insure

steadiness and ease of handling. A metal cap was made to fit over the back of the outer brass cylinder into which could be placed a metal ring with a central opening, in case it was desired to place the film in position and protect it before being exposed. In practice, however, this cap and ring were not used, as no time was lost between getting the image into focus and then photographing it. Over the front

position of the macula, by the use of a cataract knife and sharp scissors to remove the window of sclera, choroid, and retina. It was found possible to do this without appreciable loss of vitreous or noticeable collapse of the globe. Holding the eye with the window up, the inner brass tubing was placed over it, so that the window was snugly against the optical glass at the back. The eye was held in this

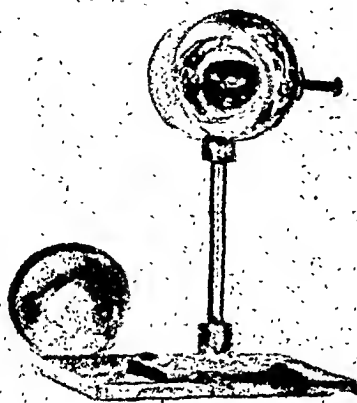


Fig. 2 (Mann). Sheep's eye mounted and held by plaster in inner cup, which has been assembled into outer tube. Note set screw at side for keeping position of inner cup firm. Eye ready for use as a camera.

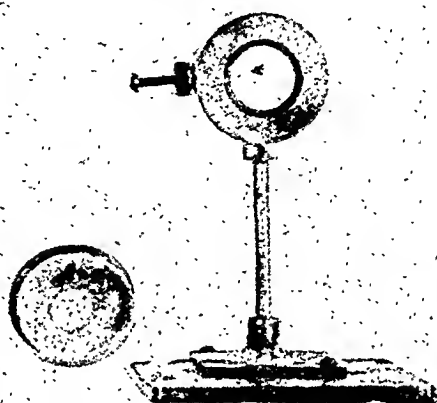


Fig. 3 (Mann). View from rear of holder containing sheep's eye, showing window in coats of eye at posterior pole. Sclera fits firmly against optical glass.

of the outer cylinder could be placed a camera shutter to assist in regulating the time of exposure and if desired, narrowing the size of the effective pupil, which in these animals was usually quite dilated. Such a shutter was used in a number of the experiments performed but, in general, proved to be of no great advantage, all exposures being instantaneous. For other types of objects photographed it might, however, offer an advantage.

In preparing the eye for photography, it was first necessary to dissect from the sclera all adherent fat and connective tissue, then a small square window, approximately 4 mm. in size, was cut at the posterior pole of the eye in the estimated

position while the whole was inverted. In order to hold the eye in the proper position with the window against the optical glass and not permit any loss of vitreous, a quick-setting plaster (Kerr's Snow White Impression Plaster No. 2) was poured around the eye from in front. This held it securely, and it was not found that the plaster reached the posterior part in any way to interfere with visualization through the glass and window. Dental cement (S. S. White) was also tried for this purpose; it held the globe securely but became so hard it was difficult to remove, hence its use is not recommended. The inner tube was then mounted in the outer holder, being pushed completely to the



back of it, so that the center of the optical glass protruded slightly through the opening in the outer cylinder (figs. 2 and 3). During this process of preparation the media usually remained quite clear, and with an ophthalmoscope one could read newspaper print placed against the optical glass. In some cases the cornea was irrigated with normal saline solution at short intervals.

A part of a visual acuity chart had been photographed on a negative which was



Fig. 4 (Mann). Instantaneous exposure of visual-acuity-chart negative with transmitted light.

Fig. 5 (Mann). Newspaper headline with daylight and 1/50 second exposure.

Fig. 6 (Mann). Human eye, 60-watt bulb, and 1/10 second exposure.

placed on the front of an ordinary viewing box, giving a constant illumination from behind, with the letters appearing white against a black background. When the eye in its holding apparatus was directed toward this object the letters from this chart were seen sharply and distinctly as inverted letters in the window at the back of the eye. It was noted, however, that this was true for any and all distances at which the eye might be placed from the chart. This was due to the fact that the image was clearly seen by the observer's eye whether it was formed in the vitreous, in the retina, or in the air behind the window. This was demonstrated by placing a small piece of ground glass against the optical glass. When this was done the letters were visualized on the ground glass *only* when very exact focusing was done by varying the distance of the eye from the object, a very slight increase or de-

crease of this proper distance for focusing then causing the image to blur and disappear entirely. Many films were exposed with negative results before the need of such precise focusing was realized in practice, although it had been anticipated on a theoretical basis. The extremely sharp image seen in the window had been deceptive; thereafter all focusing of the image was done with the ground glass. It was found in all cases that for a sharp focus on the ground glass the distance from the object to the eye must be rather close, as might in part be accounted for from the fact that these animal eyes often showed a slight degree of myopia when viewed with the ophthalmoscope, this being further increased by the fact that the film was of necessity placed slightly behind the normal position of the retina, with the thickness of the choroid, sclera, and optical glass lying in front of the film. Post-mortem changes together with lowered intraocular pressure might also be a factor in exaggerating the apparent myopia.

When this apparatus was used, as indicated above, with a small piece of film backed with black photographic paper held over the optical glass behind the window, satisfactory photographic images were obtained of the visual-acuity chart and several other objects as indicated in the illustrations (figs. 4 to 12). Exposure time could not be measured exactly except in a few cases in which the shutter was employed; in the majority the exposure was instantaneous, the light in the viewing box being snapped rapidly on and off. After the proper position of the eye had been determined by use of the ground glass the film was placed in position in the dark by the sense of touch and exposed and immediately developed.

Every effort was made to keep the cornea clear by keeping it moistened with



Fig. 7 (Mann). This is figure 4 enlarged about seven times.



Fig. 8 (Mann). This is figure 5 enlarged about five times.



Fig. 9 (Mann). This is figure enlarged about six times.

normal saline, and fresh eyes were used after every few exposures. However, in one case a satisfactory photograph was made after an eye had been kept overnight in an icebox. In some cases, when the eye appeared to be abnormally soft, normal salt solution was injected into the vitreous with a hypodermic syringe, to produce an approximately normal ocular tension. No other effort was made to maintain the intraocular pressure at a normal range, but especially when sheep's eyes were used the eyes did not appear to develop sufficient hypotension to produce effects deleterious to the object of the experiment.

While the practical importance of utilizing the eye for a camera and obtaining an image which approximately corresponds to the image cast on the retina of the eye in life may not be overwhelming, it does suggest possibilities in physiologic optics, at least in a demonstration of well-

known hypotheses. For example, the size of the retinal image in relation to the object and the distance could be well demonstrated, especially with further improvements in technique. Our difficulty in this regard, in spite of repeated attempts, lies in the extremely small size of the retinal image when the object is at any distance, making photography of distant objects almost impossible. Accepting the hypothesis that the smallest resolvable retinal image must have a diameter just greater than a macular cone (about 0.002 mm. according to Schultze<sup>13</sup>) we must conclude that present photographic emulsions would not permit photographing an image approaching the minimum visual angle. For practical purposes this is considered to be about one minute, although on theoretical grounds it would be less. Adler<sup>14</sup> has called attention to some of the factors that may influence the visual acuity, such as errors of refraction, size of

the pupil, intensity of illumination, and use of monochromatic light (experimental). He has also called attention to other factors, such as the aligning power of the retina, which is much more sensitive than the resolving power and which, together with physiologic influences, may greatly increase the visual acuity. In determining standards of visual acuity, the minimal visual angle of 60 seconds has been generally accepted, however, as the normal. In photographing retinal images we can, of course, eliminate all physiologic factors, but we must substitute those of a

where  $AB$  is the object,  $ab$  the image, and  $N$  the nodal point of the eye:

$$\begin{aligned} ab:AB &= bN:BN \\ ab &= AB \times bN/BN \\ \text{Since } bN &= 17.054 \text{ mm.} \\ i &= 17.05 \times O/D \end{aligned}$$

where  $O$  is the size of the object and  $D$  its distance from the nodal point of the eye.

Since the length of the eye will not always conform to the measurements of the schematic eye the image will be slightly larger in an axially myopic eye



Fig. 10.



Fig. 11



Fig. 12.

Fig. 10 (Mann). This is a photograph obtained with a rabbit's eye, enlarged about four times.

Figs. 11 and 12 (Mann). These are higher magnifications of images obtained with sheep's eyes.

physical or mechanical nature, especially as related to the nature of the photographic emulsion.

The size of the retinal image is dependent upon the visual angle formed by the object and not upon the distance of the object from the eye, so long as the distance is within the limits of accommodation, as emphasized by Southall.<sup>15</sup> Although there is a theoretical difference in the size of an image from an object subtending 1 degree at the anterior principal point of the eye from the state of full relaxation of accommodation to greatest accommodative effort, this shows a difference in size of the image between 0.293 mm. during relaxation and 0.286 mm. during accommodation, and may therefore be disregarded.

The simplest formula for determining the theoretical size of the retinal image is quoted by Duke-Elder<sup>1</sup> as follows,

and smaller in an axially hyperopic eye.

Attempts to prove these relative image sizes were not too successful with the sheep's eye and this photographic method. For example, in a sheep's eye—which required a  $-18.00D.$  lens in the ophthalmoscope to visualize clearly newspaper print held against the optical glass, with the eye placed as described in the holder, indicating an effective myopia of  $-18.00D.$ —it was found that the image was brought to a focus on the ground glass when the eye was placed 5.5 cm. from the object to be photographed. When a  $-13.00D.$  lens was placed 1 cm. in front of the cornea, the distance from the object to the cornea required to obtain a sharp focus was increased to 18.7 cm., findings quite consistent with the degree of myopia as estimated. Satisfactory exposures of the film were made at these distances. Measurement of the "O"

in the "TOZ" on the developed film at the 18.7-cm. distance from object to cornea showed it to measure 0.9398 mm. in its greatest horizontal meridian. Estimating the distance from the object to the nodal point of the eye as 198 mm., and measuring the actual horizontal diameter of the "O" in the object photographed to be 13.43 mm., should, according to the formula for estimating image size, give a resultant image of 1.1873 mm. (instead of the actual 0.9398 mm.). Several other estimations at other distances gave a similar discrepancy with about the same proportionately small size of the actual image that could be theoretically deduced.

As an explanation of this apparent error it should be emphasized that the formula used for computing the image size is based upon the findings for the *human* eye with a nodal point 17.05 mm. in front of the retina. The sheep's eye, being somewhat longer (average 28 mm.) and having a different corneal curvature, will naturally have a different nodal point, the distance of which in front of the retina has apparently never been calibrated. If one could assume the accuracy of the conditions under which the image was formed and photographed to be comparable to that existing in the living eye, it might be possible to deduce from the known formula for image size the position of the nodal point in the sheep's eye. In order that the image formed should measure 0.9398 mm. in the foregoing experiment, with the distance to the cornea 187 mm. (and therefore 215 mm. from the object to the retina or film) one would have to assume that the nodal point was approximately 14 mm. in front of the retina. This is proved by the formula:

$$i = N \times O/D$$

$$i = 14 \times \frac{13.46}{201} \text{ or } 0.9353$$

It does not seem reasonable to assume that the nodal point in any eye 28 mm. long lies as far back as 14 mm. in front of the retina and no such claim is made. It would seem probable that the technical difficulties involved together with post-mortem and ocular-tension changes and the myopia noted account for the apparent error.

Further discrepancies occurred when the eyes used for photography were placed at any great distances from the object which were incompatible with the degree of refractive error estimated. For example, in one eye with an estimated 18 diopeters of myopia (to the film, not to the normal position of the retina) a focus was obtained when the cornea was 5.5 cm. from the object, as would be expected. With a -7.50D. sph. placed 2.5 cm. in front of the cornea the distance was 6.5 mm., and with a -13.00D. sph. the distance increased to only 11 cm.; with a -17.00D. sph. to 12.5 cm., and with a -20.00D. to only 20 cm. The image became so minute at this distance that it was impossible to carry the experiment further.

It is realized that the images in all these experiments are not macular images only, due to the very obvious impossibility of photographing such minute images by present methods. Further objections may be made to the fact that the position of the film was slightly behind the normal position of the retina. Since no claim is made that the images formed are any indication of the vision obtained by the animal in life (as no consideration is given to the function of the higher visual centers) the fact that much more than the fovea is involved in the formation of these images is not really a valid criticism. The main object has been to demonstrate that the eye can actually be used as a camera, a fact that is of interest chiefly because of the frequent comparison made

between the two. It is conceivable that with future developments in photography it may be possible to demonstrate mathematically the size of retinal images according to the accepted formulas, and perhaps to prove experimentally other theories in physiologic optics.

No human eyes were available for this

study, but there is no reason to expect any important facts to be demonstrated by their use which cannot be brought out with these animal eyes, with the possible exception of more accurate determination of image size.

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# THE USE OF ARTIFICIAL-FEVER THERAPY IN OPHTHALMOLOGY

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While fever-producing agents are commonly and effectively used by ophthalmologists, the use of so-called artificial or mechanical methods of fever production have not been commonly employed in this field. The most frequently used agents have been triple typhoid vaccine, sterile-milk injections, and similar agents. It is our belief that artificial or mechanical fever has been neglected in many cases when its use might have been more effective than the agent employed.

Most objections which have been raised to the use of artificial fever we believe have been based on unsound grounds. Many of these accounts are based on reports of techniques which were in use before the artificial methods of production were developed to their present degree. Also some are based on the technique used in the treatment of sulfanamide-resistant gonorrhea, which requires prolonged sessions of high fever and is not comparable to the techniques usually employed in treating ocular diseases. Some of the objections frequently made to the use of mechanical methods will be mentioned and evaluated in an effort to correct the impressions which we believe to be in error.

1. It is thought by some that other methods possess a nonspecific action which operates even when no fever is produced. This theory has been advanced since the early days of malarial therapy, but no conclusive proof that it is true has ever been introduced. In most instances it is noted that therapeutic results obtained are usually in direct relation to the height of the febrile reaction.

2. Another objection frequently heard is that the mechanical treatment is too strenuous. Most of our treatments were

not over two hours in length, given at a therapeutic elevation of not over 105°F. and frequently less. The total elevation time was not over 3½ to 4 hours. When it is remembered that with artificial-fever therapy there is no preliminary chill, with its attendant malaise and headaches, it is obvious that it is actually less strenuous than fever therapy induced by triple typhoid vaccine. Some patients (other than eye) who have received both triple typhoid vaccine and 8-hour sessions of fever above 106°F., have stated to us that they prefer the latter method, their chief objection to typhoid vaccine therapy being the chill.

3. Another contention is that artificial fever is more dangerous. There have been many more deaths and serious complications reported from the use of foreign protein and vaccines than from artificial means. While it is true that many more such treatments have been given, the incidence of serious complications in mechanical fever is probably not proportionate. Most serious accidents encountered in artificial therapy have been in the cases treated with long high fevers. Another safety factor is that the mechanical methods require expert care by trained technicians, and there is no danger that they will be carelessly given. The same facts may be used to answer another objection raised; namely, that more nursing care is needed when treatment with mechanical fever is employed. Certainly a patient with a temperature of 105°F. needs just as much care regardless of the cause of the fever. If a patient is to be given an injection of typhoid vaccine in the office and sent home, the nursing care is not given but the risk is increased. If it is given in the hospital the problem of nursing care is

just as great. It is probably much safer to give a short session of mechanical fever in the morning and to allow the patient to return to his home that evening.

4. The expense factor is frequently mentioned. While this will vary in different localities, it will be equalized in most cases if the patients are hospitalized for their vaccine therapy and treated on an ambulatory basis with mechanical means. This is practicable because the mechanical method is controllable and can be completed in a few hours, leaving the average patient in the same condition as before the treatments. In military practice, there is no difference, for the patients are hospitalized in both instances.

The unavailability of mechanical-fever therapy is the most justifiable objection. However, it has been neglected even where it is available in favor of other methods, probably because more practitioners are familiar with the other methods. If mechanical fever is popularized, there is no reason to believe it will not be made generally available.

Mechanical methods of producing fever do have certain disadvantages. Once a patient is started on malaria therapy or has received an injection of vaccine or foreign protein, he cannot decide to discontinue the treatment. There are several ways in which he can cause the mechanical treatment to be discontinued, as his coöperation is necessary to the successful administration of the treatment. He may not keep all his appointments for mechanical-fever sessions.

In our opinion, however, the advantages of mechanical-fever therapy far outweigh the disadvantages, one of the greatest advantages being that temperatures of any duration and height are easily obtained, and that if necessary

they may be repeated on the following day.

Drug therapy need not be discontinued during fever. In the series of cases herein presented, it will be noted that in most instances mechanical fever has been employed with chemotherapy in the form of either sulfadiazine or penicillin.

The Eye Department at this general hospital finds that Army and Navy personnel react erratically to the intravenous injection of triple typhoid vaccine. It is believed that this is a result of their routine immunization to typhoid and paratyphoid organisms. In rare instances these patients appear to have developed a sensitization to the vaccine and will develop unduly high temperatures. One such patient developed a temperature elevation of 106°F. for four hours following the intravenous injection of 25 million killed organisms. In most cases, however, the febrile reaction leaves much to be desired. In our experience the temperature elevation rarely is greater than 100.6° and frequently not over 99.6°F., following the first injection (25 million killed organisms).

Another objection to the use of triple typhoid vaccine in some instances is the fact that it cannot safely be used on two successive days. This is due to the possible occurrence of a second reaction on the day following its injection.

This fact together with the uncertainty of the febrile reaction places the attending ophthalmologist at a serious disadvantage. Prompt, adequate, and repeated fever therapy is a sight-saving measure in many eye diseases. This is particularly true of the following conditions:

1. Beginning intraocular infection following penetrating injuries.
2. In acute optic neuritis or retrobulbar neuritis of inflammatory origin.

It is not unusual in such cases for vision to drop from normal to light perception in only a few hours' time. Recovery following adequate fever therapy is frequently just as spectacular.

3. In acute secondary glaucoma due to blockage of the iris angle with inflammatory debris. Particularly is this true of those cases in which repeated paracentesis and other means have been unsuccessful in controlling the tension.

4. In acute iridocyclitis.

5. In cases of severe corneal ulcer and corneal abscess. Space does not permit a résumé of all of the many types of ocular pathologic change which respond favorably to fever therapy. These have been well covered in many previous reports by competent observers. Cordes<sup>1</sup> has made a comprehensive report of this subject together with a very complete bibliography.

The following cases treated by artificial-fever therapy at Billings General Hospital are reported. This group does not constitute all the ophthalmologic cases treated by this method. A variety of different pathologic conditions is presented to show the possibilities of mechanical-fever therapy. It will be noted that a number of cases are included which had been treated previously with triple typhoid vaccine with unsatisfactory results. To date, no complications whatever have been encountered.

#### CASE REPORTS

CASE 1. DISCIFORM MACULAR DEGENERATION (KUHN JUNIUS TYPE). E. R. H., aged 35 years was admitted to the Eye Service, Billings General Hospital, on February 21, 1944, complaining of blurred vision in the right eye of three weeks' duration.

Vision on admission was: O.D. 20/20 -2, J1 blurred (uncorrectable), ma-

crospia present, and O.S. 20/20.

The eye examination was negative except for the following fundus changes in the right eye: There was a slaty-gray oval elevated lesion one-half disc diameter in size at the temporal margin of the fovea. This was elevated one-half diopter. Hemorrhage in the deep layers of the retina was noted along the temporal margin of the lesion and there was some subretinal infiltration, with hemorrhage extending below and nasally to the fovea. A 4-degree absolute paracentral scotoma was present.

A diagnosis of Kuhn Junius macular degeneration of the juvenile type, right eye, was made. The patient was thoroughly studied. The throat, sinuses, and prostate were negative. Dental consultation and full mouth X-ray studies revealed an advanced degree of periodontal infection, for which a complete extraction was ordered. Blood studies including the serologic tests for syphilis and agglutination tests for undulant fever were negative. The Frei test was negative. X-ray studies of the chest and medical consultation failed to demonstrate any evidence of pulmonary disease. Intradermal skin tests, using old tuberculin in the dilution 1 to 10 million, were strongly positive. Because of the nature of the pathologic change in this type of lesion (hemorrhage beneath Bruch's membrane)<sup>2</sup> it was felt some form of therapy should be used which might cause the absorption of this bleeding. In view of the patient's extreme sensitivity to tuberculin, the close proximity of the lesion to the fovea, and the fear of a focal reaction following tuberculin therapy, with the likelihood of permanent loss of central vision, it was decided to withhold tuberculin therapy until fever therapy could be given a trial.

The first fever treatment was given on



March 1st. Therapeutic time 2 hours; temperature elevation 105°F., total elevation time 4 hours, 15 minutes. Penicillin (100,000 units dissolved in normal saline) was administered intravenously during the therapy. Examination of the fundus oculi the following day showed no evidence of exacerbation of the lesion, and absorption of a large part of the deep retinal hemorrhage. Four more fever treatments were administered.

*March 6th.* Therapeutic time 4 hours; elevation time 5 hours, 35 minutes. Temperature elevation to 105°F., with simultaneous administration of 100,000 units of penicillin, by intravenous injection.

*March 9th.* Therapeutic time 3 hours; elevation time 4 hours, 50 minutes. Temperature elevation to 105°F.; 100,000 units of penicillin were given by intravenous administration during the treatment.

*March 13th.* Therapeutic time 3 hours; elevation time 5 hours, 10 minutes. Temperature elevation to 105°F.; penicillin, 100,000 units, administered by intravenous injection.

*March 16th.* Therapeutic time 3 hours; elevation time 5 hours, 15 minutes. Temperature elevation to 105°F.; penicillin, 100,000 units, administered by intravenous administration.

During the period of treatment all evidence of active bleeding at the margins of the lesion had disappeared. The lesion itself had become flattened and much less conspicuous. After the first fever treatment on March 1st, removal of the diseased teeth was begun. Extractions were followed by ophthalmoscopic study to be on the alert for any evidence of focal eye reaction. No such reaction occurred and the elimination of all dental foci was accomplished without incident. Vision on March 24th was holding at 20/20-2, and the patient was discharged to duty after dental prostheses had been fitted. He has been followed at intervals in the

Eye Out-Patient Department since. The vision remains 20/20-2 and there has been no evidence of reactivation of the macular disease.

We believe that fever therapy arrested the progress of the macular lesion in this case. It is of further interest that improvement in the fundus picture began after the first treatment and prior to the removal of the dental sepsis. The cleaning up of the dental infection following fever therapy may have played a role in maintaining arrest of the lesion.

CASE 2. CHRONIC RECURRENT SUPERFICIAL PUNCTATE KERATITIS WITH SECONDARY IRIDOCYCLITIS. E. H. L., a colored officer, aged 26 years, was admitted to the Eye Service, Billings General Hospital, on May 30, 1944, for treatment of a bilateral chronic recurrent keratitis and iridocyclitis of eight months' duration.

Vision on admission was: O.D. 20/200, J1, correctable to 20/20-2 with -3.00D. sph. O.S. 20/100, J1, correctable to 20/25-1 with -3.00D. sph.

Pertinent findings at this Hospital were those of a bilateral recurrent superficial punctate keratitis, with some associated photophobia and blepharospasm due to secondary iritis. The conjunctiva showed only a moderate hyperemia, and repeated smears and cultures of conjunctival scrapings were negative. Both eyes showed numerous 1-by-1-mm. round, healed, corneal opacities, most marked at the limbus, and a few scattered similar opacities in the center of the cornea of the left eye. This patient had been thoroughly studied during his eight months of continuous hospitalization prior to admission here.

Repeated serologic tests for syphilis were negative. One tooth, R-14, had been extracted because of a periapical abscess. Allergy study had shown nothing sig-

nificant except a strongly positive patch test to tuberculin. Desensitization to tuberculin had been carried out for the preceding 2½ months, the patient having received 40 injections up to the time of his transfer to Billings General Hospital. Penicillin therapy, 15,000 units each injection, had been given by intramuscular injection over a 5-week period at 3-hour intervals day and night with only questionable benefit.

Fever therapy using typhoid vaccine had been unsatisfactory. Seven treatments in all had been given, the fever response to the first injection was 101°F., to the second 100°F., and to the next five injections the temperature elevation had varied from 99 to 99.6°. Biopsy specimen from a cervical gland with guinea-pig injection had been negative in 1941. Local treatment had consisted of the administration of atropine and hot compresses locally, a high-caloric and high-vitamin diet, with addition of riboflavin.

Following the patient's admission here, he was again carefully surveyed. X-ray studies of the chest, sinuses, and teeth were negative. The prostate gland was normal. Local treatment was continued; namely, atropine and hot compresses. Various local antiseptics, zinc sulphate, and metaphen brought about no improvement. Penicillin as local eye drops made up in normal saline (1 c.c. per 1,000 units, 3 drops) was given every hour during the day and every 2 hours at night for 2 weeks without benefit. General measures consisted of a high-caloric, high-vitamin diet with riboflavin and fortified with 75,000 units of vitamin A daily. Tuberculin desensitization was continued.

In spite of this therapy, however, the multiple areas of superficial punctate keratitis continued to recur in crops of 5 to 7 at a time. These would take a stain with fluorescein for 4 to 5 days and then

gradually heal, leaving no permanent opacity. On slitlamp study they appeared to involve only the outer half of the corneal epithelium. They were apparently less severe than the previous lesions, which had left permanent corneal opacities.

A prominent and consistent finding in this case had been an almost complete bilateral corneal anesthesia. Because of this fact, it was felt the disease might be largely on a neurotrophic basis. Because nothing else seemed to be offering this patient relief of his symptoms, it was decided to try fever therapy in the fever cabinet. The treatments were given as follows:

*August 7th.* Therapeutic time 2 hours, at 105°F.; elevation time 3 hours, 15 minutes. *August 10th.* Therapeutic time 2 hours, at 105.6°F.; elevation time 3 hours, 10 minutes.

A striking feature of the local ocular reaction to fever in this case was the prompt return of corneal sensitivity. This was noted the day following the first treatment and has been maintained. At the present writing, September 26th, both eyes have been free from the recurrent keratitis for over five weeks. Both eyes remain white and quiet and the patient has no symptoms referable to either eye.

**CASE 3. GLAUCOMA, SECONDARY, CHRONIC.** E. E. H., aged 37 years, was admitted to Billings General Hospital on January 28, 1944, complaining of intermittent pain over the left frontal and temporal regions, and blindness, pain, and redness of the left eye. The vision in the left eye had failed 12 years before. The right eye had no significant symptoms. The left eye showed an injected globe with a steamy cornea, a deep anterior chamber, seclusion and occlusion of the pupil, and an ocular tension of

60 mm. Hg (Schjötz). The left eye was also divergent about 20 degrees. Slitlamp examination showed no evidence of active iridocyclitis. Enucleation of the blind painful eye was advised but was refused, and the patient expressed a desire that some other surgical procedure be tried first in an effort to save the globe. A cyclodiathermy operation was performed on February 4th, three rows of diathermy-needle punctures being made over an area of two thirds of the ciliary body. At the same time the divergent strabismus was corrected by a tenotomy of the externus and a resection and advancement of the internus.

The postoperative reaction subsided slowly; on February 12th the tension had dropped to 43 mm. Hg. Fever therapy was advised in an effort to speed recovery and was given as follows:

*February 15th.* Therapeutic time 2 hours, 1 minute, at 103.3°F.; elevation time 3 hours. *February 21st.* Therapeutic time 3 hours, 15 minutes, at 103.5°F.; elevation time 4 hours, 45 minutes. *February 23d.* Therapeutic time 2 hours, at 103.3°F.; elevation time 2 hours, 30 minutes. *February 28th.* Therapeutic time 2 hours, at 103.3°F.; elevation time 3 hours, 30 minutes. *March 4th.* Therapeutic time 3 hours, at 105.3°F.; elevation time 5 hours, 5 minutes. *March 8th.* Therapeutic time 3 hours, at 105°F.; elevation time 5 hours, 15 minutes. *March 13th.* Therapeutic time 3 hours, 10 minutes, at 105.4°F.; elevation time 4 hours, 40 minutes. *March 16th.* Therapeutic time 3 hours, 5 minutes, at 105°F.; elevation time 4 hours, 30 minutes.

During this course of fever therapy the tension of the eye had gradually dropped to normal [13 mm. Hg (Schjötz) on March 17th] and the globe had become white. This patient noted so much relief of pain and congestion of the eye following the first fever therapy that he

asked that the treatment be continued. He was discharged to duty with a cosmetically good, quiet eye, and complete relief of the headaches.

It is our belief that fever therapy in this case hastened absorption of the postoperative reaction in the globe, materially increasing the patient's comfort and speeding his convalescence.

#### CASE 4. IRIDOCYCLITIS BILATERAL WITH CENTRAL EXUDATIVE CHOROIDITIS.

R. E. C. was admitted to Billings General Hospital on November 1, 1943, for treatment of a recurrent gonorrheal urethritis. He had had three courses of sulfathiazole at previous hospitals but no permanent cure of his urethritis had resulted. He was treated with penicillin, 50,000 units divided into five 10,000-unit doses and given at 3-hour intervals. Following this therapy, he developed a clinical cure and was discharged on November 16th, but the urethritis again recurred and the patient was again hospitalized on December 7th, at which time he was given 100,000 units of penicillin divided into 10 doses given at 3-hour intervals. This therapy effectively cured the urethritis and the patient was discharged on December 13, 1943. On December 30th, he was admitted to the Eye Service, Billings General Hospital, for treatment of an acute iridocyclitis of the left eye. Vision on admission was O.D. and O.S. 20/20, vision in the left eye being a little blurred. All foci of infection were eliminated. Repeated examinations of the prostate were negative for evidence of recurrence of his gonorrhea. The tonsils were removed. A full-mouth X-ray study showed periapical abscess of L-7 and 8, and these teeth were extracted. The blood serology was negative. Local eye treatments consisted of the administration of atropine and hot compresses. Foreign-protein therapy was instituted, using triple

typhoid vaccine beginning with 50 million killed organisms. These injections were continued for the next 5 weeks (until January 15th), being given at 3- to 4-day intervals and up to 300,000,000 killed organisms per injection. The febrile reaction was poor, the highest temperature attained being 100.2°F. Systemic reaction was severe and characterized by severe chills, headache, and depression. In spite of these measures, the iridocyclitis of the left eye had become worse, and vitreous opacities and macular edema had appeared in the left eye, with a drop in vision to 20/70, J3, uncorrectable. An active, acute iridocyclitis had also developed in the right eye. On February 1, 1944, 100,000 units of penicillin dissolved in 1,000 c.c. of normal saline were given by continuous intravenous drip, and on the following two days 100,000 units of penicillin were administered daily by intramuscular injection every 3 hours day and night.

On February 4th, the day penicillin therapy was stopped, the vision in the left eye had improved from 20/70 to 20/30, and the cells had almost disappeared from the anterior chamber and retro-lental spaces of both eyes. One week later the vision in this eye had slipped to 20/40—4 with recurrence of cells in both eyes. Good pupillary dilations and hot compresses had been maintained during this period. On February 8th, treatment with penicillin as local eye drops was begun (1 c.c. per 2,500 units, made up in normal saline). These drops were given every 2 hours day and night for 2 days, but no improvement in the macular picture or in the vision of the left eye ensued. There was, however, some clearing of cells in the anterior chamber of each eye following this therapy.

On February 10th, the patient was given his first treatment in the fever cabinet. Total therapeutic time 2 hours, 45 min-

utes at 106°F.; total elevated time 4 hours, 20 minutes. Penicillin (100,000 units) was administered by intravenous injection during this fever therapy. Visual improvement the following day was striking, the recorded vision on that day, February 11th, being 20/20 both eyes (uncorrected) as compared to 20/70 O.S. the day before. Only a few cells were present in the anterior chamber of either eye, and there was much less edema in the macula of the left eye. This patient received two more treatments in the fever cabinet: On February 16th, therapeutic time, 4 hours at 106°F.; elevation time 6 hours (100,000 units of penicillin were again given intravenously during the treatment). The vision remained 20/20 O.U. with both eyes white and with only an occasional cell in either anterior chamber until March 10th, at which time the vision of the right eye had dropped to 20/25—1 and the iridocyclitis had recurred in this eye. During the foregoing period, the patient had developed a marked local and general sensitivity to atropine. Hyoscine had been substituted, but after one week had to be stopped because of a generalized urticaria. On March 14th, he received his third treatment in the fever cabinet (therapeutic time 3 hours, 30 minutes at 106°F., elevation time 5 hours, 30 minutes) and 100,000 units of penicillin were again given intravenously during the fever treatment. On the following day, all cells had practically disappeared and the eyes remained quiet with uncorrected vision of 20/20, J1 thereafter. This patient was kept under observation for six more weeks, but there was no further evidence of recurrence.

This case presents many points of interest. We believe it probable that the etiologic factor was a sulfathiazole- and penicillin-resistant gonorrhea. The condition continued to progress with involve-

ment of the second eye in spite of fever therapy, with triple typhoid vaccine, the elimination of foci of infection, and local eye treatments. Temporary improvement of the anterior and posterior uveitis followed the intravenous and intramuscular injections of penicillin, but the condition recurred when penicillin was stopped. Some improvement of the anterior-segment disease was noted following the use of penicillin as local eye drops, but the macular lesion was not improved. Cure of the disease was rapid and permanent following the administration of adequate fever therapy in the fever cabinet. The simultaneous administration of penicillin with the fever therapy was probably of some benefit also.

**CASE 5. CORNEAL ULCER.** F. S., white male, aged 25 years, was admitted to the Eye Service of Billings General Hospital on July 17, 1944, because of severe pain, photophobia, and blurring of vision in the right eye of four days' duration.

Similar symptoms had been noted about two months before, and the patient had received treatment for a corneal ulcer for a period of six weeks elsewhere. There was no history of injury. Vision on admission was as follows:

O.D. 6/200, J7, correctable to 16/200, J6, with  $-1.75D.$  sph.  $\approx +.50D.$  cyl. ax.  $120^\circ$ ; O.S. 17/200, J1, correctable to 20/20, J1, with  $-1.25D.$  sph.  $\approx +.25D.$  cyl. ax.  $60^\circ$ .

The left eye was normal. The right eye showed an active deep corneal ulcer, 3 by 3 mm. in size, located 4 mm. from the limbus at the 7-o'clock position. It extended throughout the entire thickness of the cornea. Slitlamp study showed the surrounding cornea to be infiltrated over an area of about 5 mm. A very severe secondary iritis was present, with marked blepharospasm and lid edema. Scrapings from the corneal lesion showed many

white blood cells and an occasional gram-positive coccus. Treatment was instituted as follows:

1. Atropine 2 percent—2 drops in the O.D. every 3 hours.
2. Hot wet compresses to the O.D. 20 minutes every 2 hours.
3. Penicillin in normal saline (1 c.c.—5,000 units), 3 drops in the right eye every hour during the day and every 2 hours at night.
4. Penicillin in normal saline (1 c.c.—2,500 units) as local eye baths to the right eye for a period of 1 hour morning and evening. (The contact eye cup was used for this purpose.)
5. Complete survey for foci of infection.

By July 24th, the ulcer took no further stain with fluorescein, and the eye was much more comfortable; however, it remained red and photophobic and some lid edema persisted. The corneal infiltration surrounding the ulcer had cleared, but the original deep ulcer, on slitlamp study, still appeared active under the epithelium which covered it. The appearance suggested a deep corneal abscess which had healed on the surface. It was difficult to maintain good dilation of the pupil even with 2-percent atropine, 2 drops every 2 hours. A general survey of the patient had the following results:

Blood serologic findings and blood count normal; urinalysis normal; X-ray studies of the chest, sinuses, and teeth, negative. The tonsils were surgically absent. Prostatic examination revealed a chronic nonspecific prostatitis with 40 to 50 white blood corpuscles present in each high-power field. The prostatitis was treated by gentle massage at weekly intervals.

Fever therapy was advised and instituted on July 26th. Therapeutic time, 2 hours at  $104.5^\circ F.$ ; elevation time 3 hours, 10 minutes. *July 28th.* Therapeutic time 2 hours, at  $104.4^\circ F.$ ; elevation time 3 hours. *August 3d.* Therapeutic time 2 hours, at  $105.4^\circ F.$ ; elevation time 3 hours, 30 minutes. *August 8th.* Thera-

peutic time 2 hours, 5 minutes, at 104.4°F.; elevation time 3 hours, 10 minutes. *August 11.* Therapeutic time, 2 hours, at 105.4°F.; elevation time 3 hours, 15 minutes.

During this period of therapy atropine and hot compresses were continued. Response to fever therapy in this case was most gratifying. The eye became white and quiet at once. The deep corneal infiltrate was rapidly absorbed. The lid edema subsided, and the secondary iritis and photophobia disappeared. The ulcer remained solidly healed. Atropine was discontinued on August 17th, following which the eye remained quiet. Vision with correction on August 30th was: O.D. 20/20-3, J1, with -2.25D. sph.  $\approx$  +.75D. cyl. ax. 128°.

*Impression.* The corneal ulcer was controlled and superficial healing attained with penicillin therapy, atropine, and hot compresses. The deep corneal infiltration, secondary iritis, and congestion of the globe, did not subside until fever therapy was given.

**CASE 6. IRIDOCYCLITIS.** E. B. J., aged 23 years was admitted to the Eye Service, Billings General Hospital, on April 27, 1944, because of severe pain, photophobia, and some blurring of vision of the right eye of one week's duration. Vision on admission was: O.D. 20/20-3, blurred, O.S. 20/20.

Examination showed an acute iridocyclitis of the right eye, with marked edema of the lids. The iris was two-thirds dilated and irregular because of posterior synechiae (atropine had been instilled prior to the patient's admission here). Slitlamp study showed numerous K.P. The aqueous was filled with non-moving cells suspended in a gelatinous exudate. The iris was muddy and engorged. The lens was clear and the fundus normal. The ocular tension was 15 mm.

Hg (Schiøtz). Local treatment instituted consisted of 10-percent neosynephrin drops, one in the eye three times daily, together with atropine 2-percent drops, two every three hours and hot wet compresses for 20 minutes, every two hours.

Fever therapy was given as an emergency, for it was feared this patient might develop a secondary glaucoma from obstruction of the iris angle with exudate and cells from the anterior chamber. This therapy was administered as follows:

*April 27th.* Therapeutic time 1 hour, 40 minutes, at 105.6°F.; elevation time 2 hours, 45 minutes. *April 28th.* Therapeutic time 2 hours, 5 minutes, at 105.4°F.; elevation time 3 hours. *May 1st.* Therapeutic time 2 hours, at 105.8°F.; elevation time 3 hours. *May 5th.* Therapeutic time 2 hours, 5 minutes, at 105°F.; elevation time 3 hours, 30 minutes.

Sulfadiazine and sodium bicarbonate, of each 1 gram, were administered every 3 hours for 4 doses preceding the first two fever treatments. Because of the development of a mild sulfadiazine urticaria, the chemotherapy was omitted in the other two treatments. Response to fever therapy in this case was spectacular, all lid edema had disappeared on the day following the first fever elevation. In addition, the eye had become free of pain and full pupillary dilation had been secured. Slitlamp study on that day showed a marked clearing of the aqueous with cells much fewer in number and actively moving in the convection currents.

Following the completion of fever therapy, the general survey for foci of infection was carried out. Some chronically diseased tonsils were removed and a mild nonspecific prostatitis was cured by periodic massage. Convalescence was uneventful with no evidence of recurrence of the iridocyclitis.

**CASE 7. PENETRATING FOREIGN BODIES INTO THE VITREOUS CHAMBER.** G. W. J., aged 23 years, was admitted to the Eye Service, Billings General Hospital, on April 27, 1944, for treatment of a retained metallic foreign body in the left eye, accidentally incurred three days previously. Vision was: O.D. -20/20, J1; O.S. light perception with faulty light projection. X-ray studies and localization showed the foreign body to be  $4\frac{1}{2}$  by 2 by 2 mm. in size, lying behind the lens in the inferior nasal quadrant of the globe. The wound of entry through the ciliary body in the temporal quadrant at the 3-o'clock position, had been closed at another hospital. The lens was clear. The vitreous was filled with blood, and no red fundus reflex could be made out. The foreign body was removed with the hand magnet on April 28th, through a peripheral iridectomy at the 9-o'clock position. Fever therapy was begun on the day of operation and continued as follows:

*April 27th.* Therapeutic time 1 hour, 30 minutes, at 103°F.; elevation time 2 hours, 35 minutes. *April 28th.* Therapeutic time 1 hour, 30 minutes, at 104.3°F.; elevation time 3 hours, 15 minutes. *May 1st.* Therapeutic time 2 hours, at 104.4°F.; elevation time 3 hours, 15 minutes. *May 4th.* Therapeutic time 2 hours, at 104.4°F.; elevation time 3 hours, 10 minutes. *May 6th.* Therapeutic time 2 hours, at 104.2°F.; elevation time 3 hours, 15 minutes. *May 12th.* Therapeutic time 2 hours, at 105°F.; elevation time 3 hours, 30 minutes.

Fever therapy was instituted as an emergency in this case because of the fear of intraocular infection. Two cilia carried into the vitreous chamber were extruded through the wound of entry and removed on May 10th and 17th, respectively. In spite of the fact that these cilia had been carried into the interior of the globe by the foreign body, this eye remained en-

tirely quiet, white, and free of pain.

On May 19th a mild, quiet iridocyclitis was noted on slitlamp examination. Vision in the eye had been lost because of the massive vitreous hemorrhage first noted on the day of admission. The eye was enucleated on May 20, 1944, because of the fear of sympathetic ophthalmia and because the vision of the eye was obviously hopelessly lost because of vitreous hemorrhage and retinal detachment. The pathologic report on this eye showed massive vitreous hemorrhage with retinal detachment and a chip of paint (chrome green) imbedded in the retina near the optic disc. Loss of the eye obviously cannot be charged to the failure of fever therapy. This case is presented for two reasons:

(1) To show that fever therapy in the fever cabinet can be safely given on two successive days. (2) This eyeball remained white and quiet and free of pain following the injury and subsequent surgical removal of a metallic foreign body in spite of the presence of two cilia in the vitreous chamber for 16 and 23 days, respectively, and a particle of paint imbedded in the retina. We believe that the fever therapy played a role in keeping the eye comfortable, quiet, and free of supuration.

**CASE 8. RETROBULBAR NEURITIS, ACUTE, RIGHT, CAUSE UNKNOWN.** N. J. R., a white corporal, aged 26 years, was first seen in the Eye Out-Patient Department at Billings General Hospital on July 7th, because of a sudden onset of "blindness" in the right eye and pain behind the eye on ocular movement. He stated that this had occurred about five days previously. Vision was: O.D. 2/200 not correctable; O.S. 20/200 correctable to 20/50.

This patient had worn glasses since childhood for the correction of a high degree of compound hyperopic astigma-

tism and a moderate right convergent strabismus. The right eye had been "straight" for the past 10 years. He stated that the vision had never been corrected to better than 20/70 O.D. and 20/50 O.S. Refraction under homatropine on July 7th was:

O.D. +5.00D. sph.  $\approx$  +1.00D. cyl. ax. 75° = 2/200; O.S. +5.00D. sph.  $\approx$  +.75D. cyl. ax. 120° = 20/50.

Both eyes were externally and internally normal. Peripheral field studies were normal. Central field studies showed an 8-degree absolute central scotoma, O.D. A diagnosis of retrobulbar neuritis was made. A general survey revealed no evidence of foci of infection in the mouth, throat, nose and sinuses, or prostate. The blood-serology, blood-sugar, and sugar-tolerance tests were negative. A careful neurologic examination for evidence of multiple sclerosis was entirely negative on two occasions. The patient did not use alcohol or tobacco.

He was treated in the Out-Patient Department for one week. This treatment consisted of thiamin 250 mg. daily by intravenous injection, and 10 mg. three times daily by mouth, and nitranitol 0.25 grain by mouth morning and evening.

Because there was no improvement in visual acuity after six days, the patient was hospitalized, so that fever therapy

might be administered as follows:

*July 15th.* Therapeutic time 2 hours, 5 minutes, at 104.6°F.; elevation time 3 hours, 10 minutes. *July 19th.* Therapeutic time 2 hours, at 104.2°F.; elevation time 3 hours, 20 minutes.

The visual acuity with correction on the day following the first fever treatment had improved from 2/200 to 20/80. Following the second fever therapy, this had further improved to 20/70. No further improvement in acuity was noted and the patient stated the acuity was then as good as it had ever been. It was our opinion that the partial residual amblyopia was probably from disuse, an incident of his strabismus in childhood and high hyperopic refractive error.

#### CONCLUSION

Artificial-fever therapy is a safe and certain method of treatment by which therapeutic temperature elevations can be easily attained with a minimum of discomfort to the patient. It has many advantages over triple typhoid vaccine. In ophthalmology excellent results have been attained with short treatment periods of not over 105°F. for two hours. When available it should be considered the method of choice in those diseases of the eye in which adequate and repeated fever therapy may be a sight-saving measure.

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# SOME OBSERVATIONS ON DIVERGENT STRABISMUS WITH ANOMALOUS RETINAL CORRESPONDENCE\*

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Strabismus incongruus was first described by Johannes Müller,<sup>1</sup> although exactly what he regarded as incongruous strabismus is a little difficult to understand. The type of strabismus to which he referred was apparently congenital and incurable, depending upon the difference in the position of the identical points of the retinas of both eyes from a subjective standpoint, the identity in the two eyes belonging to different meridians with the central point in one eye corresponding to an identical point in the other eye which is removed from the central point. At the same time, however, by the use of pressure phosphene he gave an accurate description of corresponding retinal points, which is apparently the first reference to such points. The use of local pressure on the eyeball to produce a luminous effect has been known since the time of Aristotle. Hering,<sup>2</sup> in 1863, by the use of afterimages found a similar localization of corresponding retinal points.

Donders<sup>3</sup> was somewhat confused by Müller's statements and believed that he referred only to an apparent strabismus with either a positive or a negative angle. However, Alfred von Graefe<sup>4</sup> described a very classical case of incongruence of the retina through displacement of the optic nerve. This he described as due to the macula, together with the optic nerve, being strongly displaced inward. He cited, likewise, another case<sup>5</sup> of true incongruence of the retina in which the macula is said to have occurred at the nasal side of the optic nerve in one eye. Furthermore, von Graefe discussed the subject

somewhat in detail in a clear manner<sup>6</sup> although Arlt<sup>7</sup> was still somewhat confused by his description. He believed, however, that these were not true incongruities of the retina but asymmetrical development of the two halves of the eye. Both Donders<sup>8</sup> and Von Jaeger<sup>9</sup> believed these to be cases of apparent strabismus without actual deviation of the visual axes.

Duane,<sup>10</sup> in discussing the subject of retinal incongruity in general, gives to von Graefe credit for the original discovery. In 1842, Pickford<sup>11</sup> had previously described the first instance of a true retinal incongruity, later to be followed by a large number of similar observations. Duane points out the fact that retinal incongruity is frequently associated with horror fusionis, which von Graefe called "Antipathy to single vision," and cites the close relationship between incongruity and horror fusionis. In a review of 42 cases of incongruity, he cited 9 which were exotropic and 5 others which were exotropic with vertical deviation. One case given in detail cites the case of a boy, aged 18 years, who had had a divergent strabismus since the age of two years. Operations had been performed upon one eye when he was 12 years old and upon both eyes when he was 16. There was a resulting diplopia and marked asthenopia and only 3 degrees of objective deviation. Images were fused with the amblyoscope, however, only when the tubes were converged 30 to 40 degrees. Correction of the refractive error caused disappearance of the diplopia and asthenopic symptoms.

Concerning divergent strabismus, Belschowsky<sup>12</sup> pointed out that, while perfect binocular vision and depth perception

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might be present even with good fusional amplitude during latent periods of divergent strabismus, diplopia is absent during the manifest periods of squinting. Likewise, if diplopia images are produced by any one method, they will not be crossed but will show an anomalous retinal correspondence approximately equal to the divergent position of the eyes. Prisms, base in, produce diplopia. With vertical prisms the objects are seen one directly above the other or with only a very slight lateral displacement. In the afterimage test of Hering, the vertical image belonging to the right eye is displaced more or less to the right of the center of the left afterimage. One gains the impression from his description that the correspondence in such instances is normal during the latent period and anomalous if the squinting is manifest. He feels that in every case of constant divergent strabismus an anomalous correspondence will be found, with alternate suppression of the squinting eye. Likewise, he warns, horror fusionis frequently occurs and should be looked for in every case of alternating divergent strabismus. Following surgical correction of the strabismus, homonymous diplopia is likely to be present and to persist for a longer or shorter period of time until there is orthophoric suppression or binocular vision is reestablished.

Concerning the operative correction of such cases, he described in detail one case. He states: "There are cases of divergent strabismus, fortunately rare, which baffle the doctor in spite of the greatest care and experience and the greatest skill as to operative technique." A boy, aged 5 years, with 30-degree divergent strabismus and poor convergence underwent an operation in which advancement of both internal recti combined with recession of both external recti was performed. A 20-degree divergence remained. Three years

later advancement of both internal recti was repeated and the divergence reduced to 12 degrees, which increased to 26 degrees within the next month. "In addition to the ordinary sutures, auxiliary double-armed needles were passed through the body of the muscles and fastened beyond the vertical meridian both above and below." The immediate effect was excellent, but divergence developed again and increased to 30 degrees within three months. Adduction was poor, both before any surgical attempt was made and before the third operation was attempted. Bielschowsky believed that the defect might have been due to some congenital anomaly, which defect he was never able to discover, even after the most careful search, and he was unable to account for the very unsuccessful result. He does not state, however, whether or not anomalous retinal correspondence was present.

Concerning development of anomalous correspondence Bielschowsky<sup>13</sup> states that little is known except that investigators agree that it seldom occurs in squint arising after the sixth year. Exceptions occur, however, in some individuals with high exophoria in whom a latent squint becomes a manifest divergent strabismus but reveals no evidence of diplopia. When double images are produced by the red glass and prisms, there is an homonymous diplopia showing the characteristics of anomalous retinal correspondence adapted to the angle of the strabismus. He feels, likewise, that, because of the unstable nature of the anomalous correspondence, the time-consuming effort to determine its presence or absence is a matter of questionable value. It is entirely within the realm of possibility that the correspondence in the aforescribed, very unsuccessful case of divergent strabismus was never determined.

The question of anomalous retinal correspondence in divergent strabismus has

received little or no attention except by Duane and Bielschowsky. Howe,<sup>14</sup> Savage,<sup>15</sup> and Worth<sup>16</sup> do not mention the subject. On the other hand, Chavasse<sup>17</sup> states that normal sensory correspondence is particularly common in divergent strabismus, especially if intermittent. This is also true even if there is an insufficiency of convergence at an early date. He does subscribe, however, to the remark of Bielschowsky that anomalous retinal correspondence may occur in older individuals in whom a latent exotropia may become a manifest divergent strabismus. He cites also one case<sup>18</sup> of a girl, aged 12 years, who had alternating divergent strabismus with good convergence, who had at times a normal and at other times an anomalous retinal correspondence. Duane<sup>19</sup> found and admitted cases of divergence excess, in whom the convergence is normal in spite of the high exophoria.

The subject of divergent strabismus apparently involves two definite classes of cases. The first comprises those individuals who at an early age have a spasm of one external rectus when the eyes are focused upon a distant object. This type of strabismus is definitely intermittent in character and remains latent most of the time. Strabismus is no more pronounced nor frequent when the child is fatigued. Spasms of one or the other eye outward may occur at any time of the day, the strabismus disappearing and binocular fixation assumed if the child's attention is focused upon the defect. The movement of recovery in producing binocular fixation is brought about either by a blinking of the eyes or a voluntary fusional effort. The strabismus remains intermittent and becomes manifest only when the individual is relaxed. Diplopia is generally absent. Should the deviation reach the degree at which voluntary fusional efforts are insufficient to produce binocular fixation for distant objects, it may still be

produced for near objects. In many instances an individual may have an intermittent or even a constant divergent strabismus for distance and binocular fixation at one-third meter. Asthenopic symptoms occur when the eyes are used for reading or other close work, are apparently due to the extremely high exophoria, and may be present in spite of a normal convergent near point.

Convergence usually remains intact and oftentimes normal in spite of high degrees of deviation for both distant and near objects. One individual, who had a constant divergent strabismus of approximately 70 arc degrees alternating in character, was able to produce binocular fixation for near by the aid of a looking-glass. I believe that the ability to produce binocular fixation for near, in spite of a high degree of deviation for distance, is the most important single test for the successful outcome following surgical intervention. Thus, an individual may at times have an anomalous correspondence adapted to the angle of the deviation, but the anomalous correspondence is not constant and may be varied according to the state of the muscle balance itself. Should diplopia occur in such cases following surgical intervention, it is due to a temporary overcorrection or lack of external rotation and is definitely homonymous in character. I have never seen it persist except for a short period of time.

I have not failed to find a successful surgical result in any individual who is able to produce binocular fixation, spontaneously or with voluntary fusional effort, in any case of divergent strabismus. It would appear that this strabismus arises as a pure divergence-excess anomaly, and, although the exophoria for the near point is increased as a result of anatomic changes in the muscles, produced by the spasms and relaxations of the external rectus, the convergence func-

tion itself remains intact and is not ultimately broken down by the divergence excess. Davis<sup>20</sup> has reported an excellent example of this type of anomaly. It would appear that a purely divergent type of anomaly does not have the deleterious effect upon the fusion center that is true in the case of the convergent anomalies.

The second class comprises a much more infrequent type, in which the strabismus is constant in character in the absence of voluntary fusional efforts to produce binocular fixation. Amblyopia may be and more frequently is present than in the first type described. Some degree of hypertropia is generally present, but no true cases of double hyperphoria were found in this type of anomaly. The deviation usually begins shortly after birth or even as late as the age of adolescence. The amount of deviation is fairly constant, both for distance and near, and is, in the vast majority of cases, greater than or equal to the amount of deviation for distance. Convergence in four cases out of five is faulty. I do not believe that the convergence function is paralyzed, for it can be greatly improved by exercise, but it does not approach the normal convergent power. The anomalous correspondence is constant in that it is never normal and then anomalous. The fusion is extremely poor; sometimes first-degree fusion may be present but oftentimes even this is lacking, which in all probability accounts for the discrepancy between the findings of the correspondence on the synoptophore, the red glass, and the afterimage test. I believe that the former are more conclusive than the latter as an indication for surgical correction. It is in this group of cases that surgical intervention results either in a gradual increase in the amount of deviation, until the original amount is assumed, or in a constant asthenopia which is extremely difficult to relieve.

I have attempted in every case to elimi-

nate all possibilities of either traumatic or infectious involvement of the convergent center and was surprised to find that even small children, who had definite evidence of injury to the convergent center, either as a result of trauma or encephalitis, did not show the usual characteristics of anomalous retinal correspondence. The visual factor in all probability plays an important part.

In 4 cases out of 15 there was definite amblyopia, which is a high percentage as far as divergent strabismus itself is concerned. Likewise, in the only case observed, in which the anomalous correspondence disappeared spontaneously, it was apparently dependent upon an increase in the visual acuity rather than upon any change in the muscle balance. In those cases in which the patient was submitted to surgical treatment the immediate outcome of the surgical intervention was entirely satisfactory, but the deviation increased within a short period of time. The anomalous correspondence was always adapted to the angle of deviation; it decreased with surgical intervention, and increased simultaneously with the deviation itself. In the course of a month or two it usually assumed its original characteristics and amount.

It is interesting to note that in those cases in which there was a combined vertical deviation the incongruity of the images was present sometimes for the lateral and sometimes for both deviations. Fusion, however, was so poor in every instance that diplopia did not occur as a result of the surgical treatment.

In some instances, in which divergent strabismus has resulted from a previous convergent strabismus at some time after the age of puberty, an anomalous correspondence adapted to the angle of the deviation is sometimes found. In others, the correspondence is normal, and diplopia occurs as soon as one eye diverges. The same is likewise true in those cases

in which a divergence has resulted from the surgical overcorrection of a convergent strabismus. In these instances, however, the anomalous correspondence rapidly disappears following the surgical correction of the divergent strabismus. Convergence exercises would seem to produce more beneficial effects than any other type of therapy, but it is not believed that the improvement is maintained, even though the correspondence is adapted to the angle of the strabismus as the improvement results. It is not felt that convergence exercises, unless maintained constantly, would prevent the strabismus from assuming its original angle of deviation.

In a small group of cases there is apparently a type of divergent strabismus that arises as a result of divergence excess with an apparently constant and unvariable anomalous retinal correspondence, yet which has good convergence and sometimes binocular fixation for the near point of one-third meter. When, however, any attempt is made to correct the strabismus, either by the use of prisms or by surgical intervention, an immediate diplopia or constant asthenopia results. This is well illustrated by case 3 in group 2 of this report, and also by the similar case reported by Duane.<sup>21</sup> The nonsurgical treatment would seem to be quite as unsatisfactory as surgery itself. Subjective symptoms are generally lacking. A decrease in the amount of deviation or a change in the type of the correspondence does not result from the use of orthoptic exercises.

The four surgical cases here reported in group 1, in which the strabismus had a tendency to resume the original angle of deviation following surgical correction, would seem to correspond in almost every detail to the case reported by Bielschowsky. It is my belief that in these cases the faulty functioning of the convergence center is the primary cause of

the poor surgical result. These must be contrasted with case 3, group 2, and the similar case reported by Duane, in which there was a successful correction of the deviation itself but an anomalous correspondence adapted to the previous angle of deviation. It is possible that over a period of years correspondence might return to normal, as there was every evidence in case 3, group 2, that the anomalous correspondence was gradually becoming more normal as evidenced by the fusion of images when the tubes were converged from 15° to 40°, six years after the last operative procedure was performed.

Group 3 represents definite instances of horror fusionis. The individual in whom horror fusionis might possibly be present has a condition for which every ophthalmic surgeon should be constantly on the alert. The classical method of diagnosis, as described by von Graefe, in which it is impossible to produce fusion of the images with any correction of the deviation and a marked increase in the deviation itself with slight overcorrection, needs no further emphasis. Both the correction of the deviation itself with prisms and by surgical correction results in a most distressing type of asthenopia or diplopia. As stated previously, the deviation itself generally produces no cosmetic defect. Binocular fixation and binocular vision are likely to be present at one-third meter, while constant deviation of the visual axes from six meters to infinity is often present. Very great care in the correction of the refractive error usually results in the complete and total cessation of all the subjective symptoms, and the condition itself would seem to be dependent upon a defect in the sensorial as much as upon a defect in the motor apparatus and the various pathways.

It might be argued that the three cases represented in group 2 belong in the definite category of horror fusionis with

a high degree of deviation. I do not believe, however, that they can be placed in this group, for there was not the least attempt on the part of any one of these individuals to fuse images with a partial or total correction of the deviation present. Even the slightest correction of the deviation produced a constant and insurmountable diplopia. In the first two cases of this group the convergence function was carefully studied and found to be normal. In the other instance the convergence function was found to be satisfactory following surgical treatment elsewhere, and it is assumed that it was good or normal before surgical intervention. Although the convergence function may be fairly good in horror fusionis, it does not seem possible to classify these cases in that group.

The following record is the report of 22 cases of divergent strabismus which have been followed over a period of months or years, and from which certain deductions are drawn. The cases fall roughly into the three main groups previously described.

The first group of 15 cases comprises those with constant divergent strabismus of small or high degree with total anomalous correspondence, poor convergence, and poor fusion, in which it seems impossible to correct the divergence medically or surgically. The age of onset in each instance was early in life, at or shortly after the age of puberty. In one case the onset was at 22 years of age, while in another it was thought to be present from birth. Heredity apparently played no prominent part except in three patients, who were said to have had relatives with a similar condition. Amblyopia was present in four cases, with vision of 20/60, 20/70, 20/30, and 20/200 in the amblyopic eye with correction of the refractive error. The amount of deviation was approximately equal for distance and

near, or slightly greater for near in every instance. In 4 of the 15 cases there was an associated hyperphoria that ranged from  $2^{\Delta}$  to  $18^{\Delta}$ . The hyperphoria was always concomitant. In some of the other cases the presence or absence of hyperphoria was impossible to determine subjectively. The amount of deviation varied from  $18^{\Delta}$  to  $90^{\Delta}$ , deviation of  $40^{\Delta}$  to  $50^{\Delta}$  being the usual amount.

The correspondence was checked in each instance by the use of the red glass, the synoptophore, vertical prisms, and the afterimage test. The anomalous correspondence was total in 12 cases and partially total in three. In one instance there were  $90^{\Delta}$  objectively and  $12^{\Delta}$  subjectively; in another  $20^{\Delta}$  objectively,  $4^{\Delta}$  subjectively; and in another  $18^{\Delta}$  objectively and  $10^{\Delta}$  subjectively. The convergence function was poor or nil in every instance. There were no instances in which a definite paralysis either of the lateral or vertical recti could be demonstrated, and there was no history of a previous traumatic or infectious paralysis of convergence function. None of the cases gave previous history of original convergent strabismus. The fusion was poor in all cases, although sufficiently good in one instance to measure the subjective deviation by the use of the phorometer. In some instances the fusion was so poor that the afterimage test was not reliable. In these instances the individual had a tendency to form a more or less perfect cross with the afterimage test, whereas with the synoptophore or red glass there was total anomalous correspondence. In one instance the vertical portion of the cross was definitely oblique, indicating oblique involvement, although the fusion was so poor as to make a subjective measurement of the vertical deviation impossible. The afterimage test would, however, seem to be a very valuable adjunct in testing the nature of the correspondence. Diplopia was not

TABLE 1  
DATA ON 22 CASES OF DIVERGENT STRABISMUS

Patient Sex/Age	Symptoms	Onset	Heredity	Vision R.E.	Vision L.E.	Objective Deviation	Subjective Deviation	Convergence	Fusion	Binoc. Fixation	Corres- pondence	Treatment	Results
GROUP 1													
1 C.E. F 45	None Subj.	Birth	Not known	20/20	20/25	70 <sup>Δ</sup> 78 <sup>Δ</sup> R Eye	None +	Nil	None	None	Anomalous total	Surgery	No imp.
2 R.B. M 13	None Subj.	2 yrs.	None	20/60	20/20	37 <sup>Δ</sup> 44 <sup>Δ</sup> 2 <sup>Δ</sup> RH	None +	Nil	1°	None	Anomalous total	Surgery	No imp.
3 E.M. M 16	None Subj.	Early childhood	Not known	20/20	20/20	55 <sup>Δ</sup> 57 <sup>Δ</sup> 8 <sup>Δ</sup> LH	None +	Nil	1°	None	Anomalous total	Surgery Conv. Exer.	Some imp.
4 A.M. F 33	None Subj.	16 yrs.	None	20/20	20/20	18 <sup>Δ</sup> 30 <sup>Δ</sup>	10 <sup>Δ</sup> 8 <sup>Δ</sup>	Poor	1°	None	Anomalous partial	None	
5 A.S. F 10	None Subj.	6 yrs.	Cousin similar	20/20	20/20	20 <sup>Δ</sup> 30 <sup>Δ</sup>	O Synop. -	250 mm.	None	None	Anomalous total	Conv. Exer.	Some imp.
6 J.M. M 27	None Subj.	10 yrs.	None	20/20	20/20	20 <sup>Δ</sup> 20 <sup>Δ</sup>	O None +	Poor	1°	None	Anomalous total	None	
7 B.P. M 16	None Subj.	Childhood	Mother similar	20/20	20/20	70 <sup>Δ</sup> 70 <sup>Δ</sup>	None	None	None	None	Anomalous total	None	
8 A.H. F 29	None Subj.	11 yrs.	None	20/15	20/20	90 <sup>Δ</sup> 90 <sup>Δ</sup>	12 <sup>Δ</sup> -	None	None	None	Anomalous partial	None	
9 D.R. M 12	None Subj.	1 yr.	None	20/20	20/20	32 <sup>Δ</sup> 35 <sup>Δ</sup>	None	None	1°	None	Anomalous total	None	
10 E.F. F 33	None Subj.	4 yrs.	Not known	20/40	20/20	50 <sup>Δ</sup> 50 <sup>Δ</sup> 16 LH	None +	None	None	None	Anomalous total	Surgery	Slight imp. 40 <sup>Δ</sup> 42 <sup>Δ</sup>
11 M.M. F 19	Asthenopia	9 yrs.	Sister said to be similar	20/30	20/20	25 <sup>Δ</sup> 50 <sup>Δ</sup>	None X	Poor	1° only	None	Anomalous almost total	Refraction	Relief of symptoms
12 B.B. F 22	Asthenopia	22 yrs.	None	20/20	20/200	0 <sup>Δ</sup> 15 <sup>Δ</sup>	None synop.	Nil	1° only	Dls. Yes	Total 13°	Refraction	Spontaneous recovery
13 F.M. M 16	Headache	Not known	None	20/20	20/20	20 <sup>Δ</sup> 20 <sup>Δ</sup> 5 <sup>Δ</sup> LH	None phorometer	Poor	1° only	None	Anomalous total	Refraction	Relief of symptoms
14 P.H. F 13	Headache Asthenopia	12 yrs.	Aunt has div. exc. strab.	20/20	20/20	10 <sup>Δ</sup> 20 <sup>Δ</sup>	3 <sup>Δ</sup> 2 <sup>Δ</sup>	350 mm.	2°	None	Anomalous almost total	Refraction	Relief of symptoms
15 G.A.S. M 52	None Subj.	20 yrs.	None	20/20	20/20	30 <sup>Δ</sup> 30 <sup>Δ</sup>	None red glass	None	None	None	Anomalous total	None	

TABLE 1—Continued

Patient Sex/Age	Symptoms	Onset	Heredity	Vision R E L E	Objective Deviation	Subjective Deviation	Convergence	Fusion	Bin. Fixation	Corres- pondence	Treatment	Results
Group 2												
16 T S M 14	Asthenopia	2 yrs.	Mother conv. exc.	20/20	24 <sup>Δ</sup> 12 <sup>Δ</sup>	2 <sup>Δ</sup> SO 2 <sup>Δ</sup> SO ↓	Good	1° only	For 13°?	Anomalous total	Refraction orthop. exer.	Relief of symptoms
17 R S M 14	Asthenopia	2 yrs.	Mother conv. exc.	20/20	26 <sup>Δ</sup> 12 <sup>Δ</sup>	2 <sup>Δ</sup> SO 2 <sup>Δ</sup> SO ↓	Good	1° only	for near?	Anomalous total	Refraction Orthop. exer.	Relief of symptoms
18 E E H M 34	Asthenopia	Childhood	None	20/20	5 <sup>Δ</sup> XO	40 <sup>Δ</sup> SO	Good Conv. spasm?	1° only	Near?	Anomalous	Surgery Orthop. exer. Refraction	Slight imp. in symp.
Group 3												
19 B K F 20	Asthenopia	18 yrs.	None	20/20	12 <sup>Δ</sup> 22 <sup>Δ</sup>	6 <sup>Δ</sup> 16 <sup>Δ</sup>	Poor	1° only No amplitude	Near? 13°?	Anomalous partial	Refraction	Relief of symptoms
20 G M G R F 29	Asthenopia	Adolescence	None	20/20	20 <sup>Δ</sup> 20 <sup>Δ</sup> 3 <sup>Δ</sup> R H	12 <sup>Δ</sup> 12 <sup>Δ</sup>	Poor	1° only No amplitude	Near? 13°?	Anomalous partial	Refraction	Relief of symptoms
21 H J F 38	Marked asthenopia	Adolescence	None	20/25	20 <sup>Δ</sup> 20 <sup>Δ</sup>	1 <sup>Δ</sup> SO 2 <sup>Δ</sup> SO	Good	Good No amplitude	13° Yes Dis.?	Anomalous total	Refraction	Partial relief
22 T H F 20	Asthenopia Headache daily	18 yrs.	None	20/20	25 <sup>Δ</sup> 25 <sup>Δ</sup>	8 <sup>Δ</sup> 8 <sup>Δ</sup>	Good	Poor No amplitude	Dis.? 13° Yes	Anomalous partial	Refraction	Complete relief



present in any instance, although at times it might be induced by the use of the red glass and prisms, base in, to correct the deviation. In such cases the diplopia was always incongruous in nature. None of these individuals was able to produce binocular fixation for distance or near vision, either with spontaneous or voluntary fusional effort.

Three methods of treatment were instituted in these cases for the relief of the deviation and improvement of the cosmetic defects: (1) Orthoptic training; (2) convergence exercises; (3) surgery. In each instance the fusion was so poor that the orthoptic training proved to be of little or no value. Convergence exercises, when it was possible to use them, temporarily reduced the amount of deviation present, but the deviation increased as soon as the exercises were discontinued. In one instance the exercises were continued because of the presence of asthenopia and an increase in the deviation as soon as the exercises were discontinued. Four cases of this group were treated surgically, all of which were unsuccessful in the outcome.

#### CASE REPORTS

*Case 1.* E. M., a girl, aged 16 years, developed a divergent strabismus early in childhood. She was a ward of the state, and no information could be obtained about her heredity or early childhood. She had worn glasses since 1936, although the refractive error was practically nil. There was a deviation of 55<sup>Δ</sup> for six meters and 57<sup>Δ</sup> at one-third meter, combined with 8<sup>Δ</sup> of left hypertropia. With the synoptophore the soldier was put in the house at zero degrees, making total anomalous correspondence. The after-image test also showed total anomalous correspondence.

On September 18, 1940, the right external rectus was recessed 2 mm.; the right internal rectus resected 4 mm. On

October 30, 1940, the deviation was 58<sup>Δ</sup> for distance and at one-third meter. January 1, 1941, the deviation was 44<sup>Δ</sup> of exotropia for distance and 44<sup>Δ</sup> of left hypertropia at one-third meter; January 4, 1941, 50<sup>Δ</sup> of exotropia, 3<sup>Δ</sup> of left hypertropia for distance and near. December 16, 1941, at 2½-mm. recession of the left external rectus and a 5-mm. resection of the left internal rectus were performed. The immediate effect on January 7, 1942, was 18<sup>Δ</sup> of exotropia for distance and 23<sup>Δ</sup> of exotropia for near, which increased by February 25th to 26<sup>Δ</sup> for distance and 43<sup>Δ</sup> at one-third meter. At this time convergence exercises were instituted which achieved an immediate improvement to 15<sup>Δ</sup> of exotropia for distance and 26<sup>Δ</sup> diopters for near. These values remained the same for several months under exercise, but gradually increased as soon as the exercises were discontinued. Binocular fixation could not be induced for either distance or near vision.

*Case 2.* R. B., a boy, aged 13 years, had had a periodic divergent strabismus, limited to the right eye; since the age of two years. The right eye was also amblyopic, having a vision of 20/60 both corrected and uncorrected. There was a deviation of 34<sup>Δ</sup> for distance and 48<sup>Δ</sup> for near, with approximately 2<sup>Δ</sup> of right hyperphoria with the red glass. There was total anomalous correspondence with the red glass and also with the afterimage test. Convergence was nil. The fusion was so poor as to make the use of the synoptophore unreliable. There was partial suppression with the red glass and occasional diplopia with correcting prisms.

On April 8, 1942, the right external rectus was recessed 3½ mm., and the right internal rectus resected 4 mm., with resulting correction of 14<sup>Δ</sup> for six meters and 18<sup>Δ</sup> at one-third meter. The convergence function was not improved and images were still superimposed at zero

degrees. Diplopia was not present. In February, 1943, the deviation had increased to  $22^{\circ}$  at six meters and  $33^{\circ}$  at one-third meter. Some slight degree of right hyperphoria or a very slight double hyperphoria was still present. The anomalous correspondence was not changed by the surgical procedure, and the deviation was gradually increasing.

*Case 3.* C. E., a woman, aged 45 years, had a divergent strabismus of the left eye which had been present from birth. The vision of the right eye was 20/20, left eye 20/25, with the right eye fixating more or less constantly. The deviation measured  $70^{\circ}$  for six meters and  $78^{\circ}$  for one-third meter. Convergence was nil. In the afterimage test there was normal correspondence with a more or less perfectly formed cross. Fusion was very poor and diplopia was induced with difficulty.

On January 29, 1942, a complete tenotomy of the left external rectus and a 6-mm. resection of the left internal rectus muscle were performed. The immediate effect of this operation was to reduce the deviation to  $50^{\circ}$ , a  $20^{\circ}$  improvement as a result of the surgical procedure. The condition remained practically unchanged during the next week, or perhaps with a slight increase in the amount of deviation. The correspondence was again checked and found to be what was considered a perfect cross on the afterimage test. With the red glass and prisms, however, there was total anomalous correspondence. Fusion was so poor that simultaneous macula perception could not be demonstrated on the synoptophore.

On December 22, 1942, the following surgical procedure was carried out: The left internal rectus was resected 3 mm. and advanced  $1\frac{1}{2}$  mm. The right medial rectus was resected 5 mm. and advanced  $1\frac{1}{2}$  mm. The left external rectus was again freed and recessed fully to the equator of the eyeball. The immediate effect of the surgical procedure was very

satisfactory in that the deviation was reduced to 10 degrees when the patient was discharged from the hospital. In January, 1943, the deviation had increased slightly to  $30^{\circ}$  for distant and near vision, and in May, 1943, the deviation measured  $45^{\circ}$  for both distant and near vision. The total net result of all the operative procedures had been a decrease of  $20^{\circ}$  to  $25^{\circ}$  in the total amount of deviation.

*Case 4.* E. F., a girl, aged 10 years, had had a divergent strabismus of the right eye since the age of four years. She had worn glasses which had not improved the deviation; there was no evidence of any hereditary influence as a causative factor in her condition. The vision of the right eye was 20/40, of the left eye 20/20. The deviation measured  $50^{\circ}$  of exotropia and  $16^{\circ}$  of left hypertropia for six meters and one-third meter. Convergence was practically nil. Both the afterimage and the red-glass tests showed total anomalous correspondence. The right vertical afterimage was 39 cm. to the left and 11 cm. above the central point. There was 16 diopters of hyperphoria in the six cardinal directions of the gaze.

In October, 1940, the right external rectus was recessed  $2\frac{1}{2}$  mm. and the right internal rectus resected 5 mm. The immediate effect of the operation was satisfactory, with no untoward reaction. The patient was reexamined in February, 1941, at which time the deviation was  $50^{\circ}$  of exotropia and  $16^{\circ}$  of left hypertropia for six meters and one-third meter. This deviation gradually became stationary in the next few months, showing a final measurement of  $40^{\circ}$  of exotropia and  $16^{\circ}$  of left hypertropia at six meters and  $42^{\circ}$  of exotropia and  $16^{\circ}$  of left hypertropia at one-third meter—a very slight improvement from the operative procedure. No further surgery was contemplated because of the unsatisfactory result obtained.

Group 2 represents apparently a much more uncommon divergent anomaly than the first, the chief difference between the two being the state of the convergence function. In this group, which comprises only three cases, there is poor fusion, total anomalous correspondence, good convergence function, and likewise the absence of any subjective symptoms except asthenopia. Two of the cases occurred in identical twins and might be reported as a single case, as they are almost identical. As stated previously, it might be argued that these three cases are instances of horror fusionis with a higher-than-usual degree of deviation, as the convergence function was good in each instance. I do not believe, however, that they can possibly be classified as true cases of horror fusionis.

Cases 1 and 2 are those of identical twins, aged 14 years, who had had divergent strabisms since the age of two years. They had been treated since that time by glasses and orthoptic exercises. There was a gradually increasing divergent strabismus in both cases, but no subjective symptoms except asthenopia. In one—T S—the refractive error was: R.E.  $-1.50D.$  sph.  $\approx -0.25D.$  cyl. ax.  $45^\circ$ ; L. E.  $-0.25D.$  cyl. ax.  $90^\circ$ . The vision was equal with the left eye dominant. The deviation measured  $24^\Delta$  exotropia for distance and  $12^\Delta$  for near, with square prisms. There were two diopters of esophoria on the phorometer. Convergence was excellent. There was first-degree fusion on the synoptophore, suppression with the red glass, and total false correspondence. Diplopia was present as soon as any attempt was made to correct the divergence, which was constant for distance. At one-third meter there was binocular fixation, with a movement of recovery of either eye and normal convergence. There was normal correspondence on the afterimage test,

although a slight tendency of the horizontal meridian to be tilted. No treatment was instituted, except correction of the refractive error.

In the other twin—R S—the refractive error was R.E.  $-25D.$  cyl. ax.  $90^\circ$ ; L. E.  $-1.25D.$  sph.  $\approx -25D.$  cyl. ax.  $45^\circ$ . With the square prisms there was deviation of  $26^\Delta$  for distance,  $12^\Delta$  for near, and  $2^\Delta$  of esophoria on the phorometer. Convergence was good. Prisms, base in, produced diplopia and, base out, produced suppression. There was total anomalous correspondence with the red glass and practically normal correspondence with the afterimage test. First-degree fusion only was present. No subjective symptoms were present when the glasses were worn constantly.

Case 3. E. B., a man, aged 34 years, had had a divergent strabismus that restricted him to the use of only one eye at a time, for at least the past 16 years. In 1935, he had had some orthoptic training from an optometrist. Later in the same year a recession of the left external rectus had been performed by one physician, and in 1936 a resection of the left internal rectus by another.

When first seen, in April, 1941, he complained of having had severe asthenopia and headache since the surgery, but he was quite free after a night of rest. As a bookkeeper he had considerable difficulty in performing his usual duties. Visual acuity was 20/20 in each eye, and there was practically no refractive error. No cosmetic defect was present, and there was no evident deviation of the visual axes. With square prisms and the screen test there were approximately  $5^\Delta$  of exophoria and an incongruous diplopia of approximately  $40^\Delta$  on the phorometer. With the synoptophore he was able to fuse when the tubes were converged from  $20^\Delta$  to  $40^\Delta$ , and had no more than first-degree fusion. Diplopia was absent at all

times and suppression was present with the red glass. The convergence function was excellent but tended to be excessive rather than weak. It is possible that a definite convergent spasm was present. No treatment was instituted except the correction of a small amount of astigmatic error, although the symptoms gradually became less pronounced, and in the course of two years he was able to carry on his usual duties with much less discomfort. The incongruous diplopia seemed to be gradually decreasing, as he was able to fuse on the synoptophore at approximately  $15^{\Delta}$  whereas previously  $20^{\Delta}$  was the best that he could accomplish.

Case 3 is placed in this group because of the presence of good convergence function, as it is believed that, if the identical twins had been subjected to surgery, they would show the same characteristics as in case 3; namely asthenopia, correction of the divergent deviation, and incongruous diplopia. There is nothing of importance in the heredity of these twins, except that the mother has a convergence excess and shows approximately  $2^{\Delta}$  of esophoria for distance,  $22^{\Delta}$  of esophoria for near, but with binocular fixation at all times. There was a history at one time in the boys' mother of a severe asthenopia while going to college, occasioned by an emotional upset. These three instances seem to indicate anomalous correspondence arising in an individual, with divergent strabismus due to divergence excess. Although the condition is correctable surgically, the aftersymptoms of asthenopia and headache might not warrant the correction of the cosmetic defect in the absence of severe subjective symptoms.

Group 3 represents a series of four cases in individuals in whom there is a more or less constant deviation for distance, binocular fixation for near, with

subtotal or total anomalous correspondence, and with classical findings of horror fusionis. The deviation in these cases never exceeded  $28^{\Delta}$ , was greater for distance than for near vision, with good fusion and with good convergence in one instance. There was, however, an entire absence of the amplitude of fusion. Fusion was poor except in the one instance, mentioned, and in this individual there was a tendency toward diplopia when fatigued. The anomalous correspondence was either totally or partially anomalous. Binocular fixation was apparently present in each instance at one-third meter and only once at six meters. Amblyopia was not present in any instance. Any attempt to correct the total deviation was occasioned by a spontaneous diplopia, incongruous in nature, with inability to overcome the diplopia present. Symptoms of asthenopia were generally marked and greatly increased by the use of prisms, base in, for the correction of the deviation present. Meticulous care in the correction of the refractive error resulted in every instance in a complete relief of the symptoms present. In no instance was there a definite noticeable cosmetic defect. Symptoms were definitely increased with fatigue and emotional stress.

In addition to the aforementioned three groups, one case (No. 12, group 1) is reported in detail because of a spontaneous disappearance of the abnormal retinal correspondence occasioned by an improvement in the visual acuity.

B. B., a woman, aged 22 years, had been under observation since the summer of 1938, when she suffered an injury to the left eye. At this time a small pin dart pierced the cornea of the left eye near the limbus, passing through the iris and entering the lens posterior to the equator. This produced an opacity on the posterior

lens capsule and cortex, similar to that seen in cataracta complicata, with a consequent reduction in vision to approximately 20/200. This opacity on the posterior cortex gradually became stationary, and the vision improved with a  $-1.50D.$  sph. to 20/65. The refractive error of the right eye was low hyperopic astigmatism. As vision gradually improved, severe asthenopia developed. Binocular fixation for distance and a constant divergent strabismus for near were present. At this time there were  $15^\Delta$  of exophoria at one-third meter with square prisms, no fusion, no subjective deviation on the phorometer, total anomalous correspondence on the synoptophore, and suppression with the red glass. Images were always fused at zero degrees on the synoptophore. There was a slow but gradual change in the refractive error, which changed from  $-1.50D.$  sph. to  $+1.00D.$  sph.  $\approx +1.50D.$  cyl. ax.  $120^\circ$ . With this lens there was 20/50-2 vision and a marked improvement in the asthenopic symptoms. In November, 1942, a little more than two years after the original injury, there were binocular fixation for distant and near vision, normal correspondence, and  $12^\Delta$  of exophoria, both on the phorometer and the synoptophore. As soon as the correspondence returned to normal, there was a marked cessation of all of the asthenopic and subjective symptoms in spite of the marked difference in visual acuity in the two eyes. It would seem in this instance that the visual loss was responsible entirely for the production and maintenance of the abnormal retinal correspondence, and that correction of the refractive error was the most important single factor in the reduction of the symptoms and the return to normal of the retinal correspondence.

#### COMMENTS

As a result of this study of 22 cases of

divergent strabismus with anomalous retinal correspondence, a division into three primary groups has been made. The first group, with constant strabismus, poor fusion, and poor convergence, is the most difficult in which to secure satisfactory results. Neither the anomalous correspondence nor the poor fusion can be regarded as more than secondary factors in the tendency of the deviation to return to its original value. Consequently, the poor converging power must be the primary factor, as both poor fusion and anomalous correspondence are found in divergent strabismus in which the deviation can be reduced to a satisfactory cosmetic result. On the other hand, I do not consider the poor convergence a paralysis, as marked improvement resulted from exercise, even though maximum improvement was not maintained. In a small series of cases, with paralysis of convergence due to either trauma or encephalitis, I was able to produce little or no improvement following convergence exercises, even though these were conscientiously continued for some months. This group also had normal retinal correspondence. One should, therefore, carefully weigh all the factors before attempting surgical correction.

In the second group, with good converging power but a constant anomalous correspondence adapted to the angle of the deviation, a satisfactory cosmetic result may be secured. On the other hand, severe asthenopia and occasional incongruous diplopia are unpleasant consequences of surgical correction. Diplopia itself is not a distressing symptom after surgery, for, in every instance encountered both personally and in the literature examined, fusion was too poor to give rise to constant diplopia. Spontaneous disappearance of the anomalous correspondence does not apparently follow surgical correction, as is usual with the

convergent type. Whether the long period of discomfort and rehabilitation which follows the surgical correction in this group is justifiable for removal of the cosmetic defect, is one question which should be decided by the individual himself.

The third group comprises the not infrequent cases of horror fusionis. These are individuals with better fusion, a moderate divergent strabismus for distant or near vision, with marked asthenopic symptoms. Diplopia may frequently be present but not annoying, even though the cosmetic defect is small or absent. Although fusion may be fairly good, the amplitude of fusion is nil, and binocular vision is not possible with any correction of the deviation. The anomalous correspondence is partial or total, and constant in amount. Correction of the deviation, either by the use of prisms or surgery, results in a marked increase in asthenopic symptoms. Meticulous care in the correction of the refractive errors should produce complete relief.

## SUMMARY

Twenty-two cases of divergent strabismus with constant anomalous correspondence have been studied from the standpoint of diagnosis and treatment. The fusion was so poor in some instances as to make the afterimage test unreliable.

From therapeutic results the cases are divided into three main groups:

1. Cases with poor convergence which were incurable, the deviation tending to assume its original amount and characteristics after surgical correction. Convergence exercises help to reduce the cosmetic defect but the improvement is not maintained.

2. Cases with good convergence in which the deviation can be corrected surgically. Severe asthenopic symptoms and incongruous diplopia are present for years after surgical correction.

3. Cases of horror fusionis with total or partial anomalous correspondence which are completely relieved by meticulous care in correcting the refractive error.

330 Lowry Medical Arts Bldg. (2).

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# AMYLOID DISEASE OF THE CONJUNCTIVA\*

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Amyloid is a term used to designate a product that appears as a formed element in certain intercellular regions during the course of seemingly diverse pathologic states. It is characterized morphologically by its deposition in elective sites, its more or less dependable affinities for several unrelated stains, and its homogeneity. Recent work indicates that amyloidosis is not a degenerative disease, but the result of a long-continued metabolic disorder, probably protein in nature.

The disease is referred to briefly by Fuchs,<sup>1</sup> Collins and Mayou,<sup>2</sup> de Schweinitz,<sup>3</sup> Berens,<sup>4</sup> Wolff,<sup>5</sup> and more in detail by Duke-Elder,<sup>6</sup> who states that:

The disease attacks as a general rule young adults, especially between 25 and 30 years of age, affecting either one or both eyes; about two-thirds of the cases are bilateral. The degeneration is local and its cause is quite unknown, for the sufferers are almost invariably healthy and are not subjects of general amyloid disease; but it has a parallel in localized degenerations elsewhere—in the larynx (Courvoisier, 1902), the lung (Hersheimer, 1903), and the heart (Steinhaus, 1902). In the conjunctiva it usually begins in the transition fold, extending therefrom to the conjunctiva of the lid and the bulb. The mucous membrane appears yellow, transparent, waxy, and avascular, and in places may show swellings of considerable size. As the tarsus becomes involved the upper lids form two huge tumors of such size that the patient can hardly open his eyes; the entire conjunctiva and semilunar fold form irregular masses so brittle that they are readily torn (with, however, very little bleeding) when the lids are forcibly opened; and the cornea may be involved in the degenerative process, either the whole of it (Schreiber, 1913) or in a band-shaped area (Watanabe, 1922); alternatively, and more usually, it is disorganized by pannus.

The disease goes on slowly and inexorably and medical treatment is peculiarly ineffective. The only method of alleviation is surgical removal of the larger masses when their size and weight prevent the patient from lifting the lid sufficiently. If extensive removals are re-

quired the friable conjunctiva cannot make good the defect, and it is well to use a graft of mucous membrane of the lip. Complete removal of the mass is usually impossible and inadvisable; fortunately the remainder left behind has a habit of shrinking spontaneously, although gross recurrences have been recorded (Kubik, 1924).

An early case of amyloid disease of the conjunctiva came under my observation about three years ago, and I have had the opportunity to watch the condition periodically since then.

## CASE REPORT

Mrs. H. A., aged 38 years, a beauty-parlor operator for the past 15 years, came for examination on February 17, 1941, giving the following history: For the past two years the right eye has been inflamed at intervals. The eyeball becomes red, feels sore, especially at the inner corner, waters, and discharges sticky secretion in the morning. The left eye gives no trouble except that it waters occasionally. She has never worn glasses. She has dyed her eyelashes and eyebrows over a period of at least 10 years, but has used no cream around the eyelids. She does much hair tinting and handles chemicals, but has never had any skin irritation. When the inflammation in the right eye first began, she had her family physician look at the eye and he removed some lashes from the lower eyelid. She has had no treatment except boric-acid solution, occasionally argyrol, and yellow oxide ointment, which she used when the eye was particularly inflamed. For the past three or four months she has felt a thick hardness in the lower right eyelid and friends have remarked that her lower eyelids look full.

\* Read at the eightieth annual meeting of the American Ophthalmological Society at Hot Springs, Virginia, May, 1944.

*Examination.* O.D.: The lower eyelid looked slightly fuller than the left, but there was no congestion of the overlying skin. On palpation, a hard induration, especially in the region of the fornix, could be felt. The caruncle was slightly congested, and a small droplet of mucus was present at the inner canthus. No other discharge was evident. Along the margin of the lower eyelid on the con-

mainder of the palpebral conjunctiva appeared normal. The eyeball appeared normal, as did the semilunar fold.

O.S.: The conjunctiva of the lower lid appeared slightly pale and waxy, but the conjunctival vessels were visible and there was very little thickening of the tissue. There was no palpable induration of the lid. No discharge was present. The upper lid was normal. V.: O.D. = 20/25; O.S.



Fig. 1 (Elles). Amyloidosis of palpebral conjunctiva.\*

junctival side was a slightly elevated ridge of pale, finely corrugated, waxy tissue like avascular granulation tissue. On eversion of the lower lid the conjunctival surface showed pale elevated vertically ridged tissue, much more pronounced in the nasal half of the lid, where it was elevated about 2 mm. above the tarsus. There was a tubular mass of this pale waxy tissue occupying the whole lower fornix, thicker near the inner canthus. On eversion of the upper lid a similar pale but smoother and less elevated avascular area was seen on the conjunctival surface, extending from the inner canthus about 4 mm. temporally. The re-

= 20/25. The patient was refracted and the following glasses given: O.D., +0.50D. cyl. ax.  $170^\circ$  = 20/20; O.S. -0.75D. sph.  $\approx$  +1.50D. cyl. ax.  $170^\circ$  = 20/20. The pupils reacted normally to light and convergence; the intraocular pressure was normal; the media were clear; the fundi were negative.

A smear and culture from the conjunctiva were examined and reported negative for organisms. The patient was sent for physical examination to an internist, who reported the examination negative. It was decided not to give the patient the Congo red test for fear of staining her conjunctiva, as it is known that Congo red is retained in amyloid tissue for a long period of time. A biopsy specimen was taken

\* Permission was given by the patient to publish her photograph.



from the conjunctival surface of the right lower eyelid near the inner canthus and the fold in the lower fornix. The tissue bled only slightly. The specimen was sent to the Army Medical Museum for examination. An examination of the tongue, pharynx, and larynx was negative except for an elevated mass at the extreme end of the right lower jaw, some distance behind the last tooth. This had the shape of a molar tooth but was soft tissue. A piece of this tissue was also sent to the Army Medical Museum for biopsy.

The report of biopsy from Lt. Col. J. E. Ash of the Army Medical Museum was as follows: "The report from your case shows the stroma of the conjunctiva infiltrated with irregular masses of homogeneous hyaline material which with special stain seems to be amyloid. The overlying epithelium shows irregular atrophy. There is a small amount of chronic inflammatory reaction about the hyaline masses. *Diagnosis:* Amyloidosis, palpebral conjunctiva.

"Report on tissue taken from lower right jaw: Two white nodules, measuring respectively 5 by 4 by 1.5 mm. and 5.5 by 4.5 by 2 mm., the external surfaces of which are fairly smooth. The smaller mass is indurated, the larger mass apparently much less dense.

"*Microscopic:* The specimen consists largely of dense hyaline fibrous tissue and except for the unusual thickness of the covering epithelium, has the appearance of an irritation fibroma. There is no evidence of amyloidosis."

The patient was given powdered liver, 4 gm. in orange juice, three times a day. This was continued until information regarding preparation of whole fresh liver was received from Dr. H. G. Grayzel of Sea View Hospital. The patient continued taking this latter preparation for nine months. She then refused to take it any longer. Following this therapy, the right

eyelid became much softer, but the left lower fornix began to show a small fold of waxy tissue.

During this period, only a 2-percent solution of boric acid or a mild zinc sulfate and boric-acid solution were used locally in the eye. Occasionally a slight mucoid discharge was present.

On February 15, 1942, the patient was sent to the Eye Institute of Columbia University for consultation with Dr. Phillips Thygeson, especially for investigation as to the possibility of a virus infection as a causative factor.

Dr. Thygeson's report is as follows: "We were unable to find any local infection of bacterial, virus, or other nature which could account for the condition. We were unable to find any evidence of amyloid disease in any other part of the body. . . . The only abnormal finding was the occurrence in some epithelial cells over the lesion of eosinophilic bodies of uncertain nature, some resembling the inclusion bodies of virus diseases. We made chorio-allantoic membrane inoculations, but did not obtain any lesions. The inclusion bodies resemble those of certain virus diseases, but there is no way of proving their virus nature without obtaining positive animal or egg inoculation."

Further epithelial scrapings of the conjunctiva have been made at four different intervals and in none were the cytoplasmic inclusion bodies again found.

During the patient's stay at the Eye Institute, she was given a number of injections of liver extract.

Upon her return home she was given injections of 500 mg. of ascorbic acid every 48 hours for 6 doses. This was followed by 200 mg. of ascorbic acid by mouth twice a day. Some three months later as amyloid development in the left lower lid seemed to be increasing, she was given fresh liver in addition, which she

continued for three months when she again developed a marked distaste for it. At that time the therapy was changed to calcium gluconate, one drachm three times a day and 0.5 gr. of iodine, which she continued to take for four months. This did not affect the amyloid condition; so she was again given ascorbic acid, 100 mg., and vitamin A, 25,000 units,

which involves tissues of mesenchymal origin, in contradistinction to secondary amyloidosis, which involves tissue of parenchymatous origin.

Reimann, Koucky, and Eklund<sup>7</sup> state that:

1. The primary form of amyloidosis is characterized by (a) absence of preceding disease; (b) no involvement of



Fig. 2 (Elles). Section of conjunctiva showing diffuse deposit of amyloid throughout section; few capillaries with ring formation of amyloid; lymphocytic infiltration; crypts lined with epithelium; some epithelial masses below due to cutting of section ( $\times 50$ ).\*

each twice daily. The amyloid process is showing some regression as there is no longer the small ridge of waxy tissue extending beyond the lid margin; the induration of the lids is much softer. Both upper lids remain normal save for the small originally involved area on the right upper lid near the inner canthus.

### DISCUSSION

Amyloid degeneration may follow trachoma and other chronic infections of the conjunctiva, but authors agree that these conditions are not its cause; it may arise in eyes otherwise healthy, and so be a primary affection. Primary systemic amyloidosis is a disease of unknown cause

organs or tissue usually affected in the secondary form; (c) involvement of mesodermal tissue, cardiovascular system, gastrointestinal tract, smooth and striated muscle, and lymph nodes; (d) variation in staining reactions; and (e) tendency to nodular deposits.

2. The secondary form usually follows chronic diseases and is characterized by large deposits—especially in the spleen, liver, kidney, and adrenals—and by typical staining reactions.

3. Tumor-forming amyloidosis has been especially studied by von Bonsdorff. This form is characterized by presence of small, solitary, or multiple tumors in the eye, bladder, urethra, pharynx, tongue, and especially in the respiratory tract. It is usually of the primary type but is dis-

\* Photomicrograph made at the Army Medical Museum.

tinctive enough to be grouped separately.

4. Amyloidosis occurring with multiple myeloma is in a class apart. It is secondary in nature but the distribution and character of the deposits frequently resemble those of the primary form except that huge deposits may occur in the joints and elsewhere. The spleen and liver are seldom infiltrated. Small deposits are occasionally found in the blood vessels. Thirty-seven cases have been surveyed by Magnus-Levy. According to Reimann and Eklund,<sup>8</sup> among the more important theories are those which claim that amyloidosis is due to: (a) a general disturbance of protein metabolism; (b) an antigen-antibody union and precipitation; (c) an absorption of protein; (d) a disturbance or abnormality of the reticulo-endothelial system; (e) hyperglobulinemia; and (f) hyperproteinemia and disturbance of the reticulo-endothelial system.

They injected rabbits with sodium caseinate three times a week over long periods and induced fatal amyloidosis. Soon after the beginning of the experiment, hyperglobulinemia developed in each rabbit, persisting until death. The total content of the blood was increased in the early period of the experiment but diminished below normal late in the course, when evidence of renal amyloidosis and uremia appeared. Their experiments support the view that chronic hyperglobulinemia is an important factor in the etiology of amyloidosis of the secondary type.

Smetana,<sup>9</sup> experimenting with induction of amyloidosis in mice by injection of nutrose and blocking the reticulo-endothelial system by injections of India ink to prove that the reticulo-endothelial cells are actively concerned in the formation of amyloid, draws the following conclusions:

1. The appearance of amyloid in places

where reticulo-endothelial cells are normally present, sometimes in very large numbers.

2. The formation of early amyloid in the small solitary patches which suggest its local formation.

3. The occurrence of solitary patches of amyloid apparently located within the capillaries of the liver.

4. The manifold relations between reticulo-endothelial cells marked out by phagocytized ink granules, loose ink particles, and amyloid described in the text.

5. The impossibility of demonstrating reticulo-endothelial cells in areas of forming amyloid by intravenous injections of India ink.

6. The delayed appearance of amyloid in animals after blockage of the reticulo-endothelial cells by repeated intravenous injections of India ink.

#### HISTOPATHOLOGY

Sections of conjunctiva of the author's case revealed an irregular surface with coarse lobulations. With hematoxylin and eosin stain the main tissue was an almost acellular pink-staining homogeneous substance. The surface was covered by stratified epithelium, usually polyhedral in shape, with small round oval blue nuclei in which chromatin was very fine. Occasional epithelial cells were vacuolated with the nucleus crowded to one side, giving a signet-ring appearance suggesting the presence of mucous secretion in the cells. The surface layer of epithelium varied from 1 to about 10 cells in thickness. A few crypts were seen on cross section, presenting a glandular appearance. Surrounding a few of these were a moderate number of lymphocytes. A small amount of exudate was present on the surface in one place, chiefly fibrin, polymorphonuclear neutrophils along with occasional plasma cells, eosinophils, and desquamated cells.

Beneath the surface there were very few nuclei, and the material was largely structureless. A few connective-tissue cells with slender nuclei and long processes were present. What appeared to be capillaries were sparse and small, although one or two had a large lumen. No blood was present in these. The lining

thelium and connective tissue were a very distinct blue. Congo red gave the homogeneous material a strong orange-red color, whereas iodine stained it mahogany brown. The latter stain faded rapidly. Tissue submitted to the Army Medical Museum was reported by Lt. Col. Ash to give a positive iodine stain.



Fig. 3 (Elles). Section of conjunctiva. Note altered surface epithelium; abundant structureless material (amyloid); few connective-tissue cells; capillaries with swollen endothelium ( $\times 260$ ).\*

endothelium appeared swollen. A few capillaries were surrounded by a layer of pink material giving a ringlike appearance. The greater number were free from this ringlike deposit. The homogeneous material appeared in coarse irregular lobules separated usually by thick strands of elongated cells of connective tissue and was moderately dense. Selective staining by crystal violet, Congo red, and iodine gave the staining reaction of amyloid. Crystal violet stained the material dark reddish purple, whereas the surface epi-

Duke-Elder<sup>6</sup> states that

Pathologically, the changes originate in the subconjunctival cellular tissue which suffers a massive cellular infiltration of plasma cells, leucocytes, mast cells, and wandering cells—of these the plasma cells are greatly predominant (Kubik, 1924). The earliest signs of degenerative material—amyloid or hyaline—are in the neighborhood of the small vessels (Wallgreen and Vannas, 1926). The commencement of the changes is in the connective-tissue fibers of the middle coat of the smaller arteries, which, with their subsequent enormous swelling so that the lumen may be obliterated, and the spread to the formed tissue elements with the destruction of the parenchymatous cells, have already been described. . . . The epithelium is thinned and may undergo cornification. Finally other degenerative changes may supervene: fatty in-

\* Photomicrograph was made at the Army Medical Museum.

filtration (Vollaro, 1913), glycogenous infiltration (Schieck, 1908), or calcification (Vossius, 1889); Marchi, 1908; Rumschewitsch, 1909; Kolominsky, 1912).

Leo<sup>10</sup> in a case of amyloid disease following trachoma, gave the following description of biopsy findings over a period of four years.

In 1935, the tissue showed homogeneous masses traversed by bundles of connective tissue, chronic inflammatory processes consisting of lymphocytic infiltration and plasma cells, with prevalence of the former grouped especially around the small blood vessels and many blood vessels with thickened walls. The vessels showed endothelium but were constricted. Only certain portions took specific amyloid stain, whereas the hyaline substance took the stain more generally.

In 1936, the tissue removed showed intense amyloid degeneration. It consisted entirely of a mass of amorphous material which stains irregularly. It still showed few areas of homogeneous structure which could be stained as hyaline substance. Thin remains of conjunctiva and some small blood vessels could be seen. There was no inflammatory process in evidence.

In 1938, epithelium of the tarsal conjunctiva consisted of flat lamellar cells. The subepithelium showed a wide stratum of cells, having no particular arrangement; in some places there was a reticular arrangement of connective tissue of hyaline character but no formation of follicles as in the common form of trachoma. There were many blood vessels with thickened walls and restricted lumina. The fibrosis increased and lymphocytes were scarcer; there was a progressive increase in connective-tissue bundles with hyaline characteristics. These bundles were followed by masses of amyloid substance around the blood vessels and formed compact masses. In the middle of these masses were found small calcified areas.

As the process advanced, the inflammatory process showed more and more degenerative character. Following this was a phase of hyaline sclerosis, and later a phase of amyloid degeneration. In the second biopsy the inflammatory process had ceded to an amyloid degenerative process. In the third biopsy both processes were still going on and there was still the infiltration of trachoma.

Leo agreed with the observation of Kubik (1882) and Del Monte (1910) that there are four phases of degenerative change in evolution of the process:

1. Inflammation—cellular infiltration (plasma cells which can be absent).
2. Hyaline degeneration.
3. Amyloid degeneration.
4. Calcification.

He quoted Von Gierke as saying that amyloid prefers cartilagenous tissue or tissues rich in elastic fibers and so the palpebrae show this degeneration.

Adrogué<sup>11</sup> said the mechanism of the amyloid degeneration excluded any direct intervention by the plasma cells, claiming that this direct intervention was due to the absorption of the amino acids by the collagens of the interstitial network as a consequence of the bad condition of the nutritional balance which impeded elimination through the natural channels. The transformation of the plasma cells into hyaline substance is a fact that has been proved by Unna and also by Ishihara (in the conjunctiva).

Rybnikova,<sup>12</sup> in argument for the support of the theory that amyloid localizes along the reticulo-endothelial system, drew attention to the fact that the process begins in the tunica adventitia of the blood vessels where the largest accumulation of reticulo-endothelial cells are. A study of her case of amyloid disease of the conjunctiva gave reason to suspect that toxins first produce irritation, then depression, beginning with the tunica adventitia. In some instances the walls of the vessels showed definite marks of irritation which could be demonstrated by a very active proliferation of the cellular elements of the tunica adventitia; in others only the remnants of previously existing proliferation could be seen.

Furthermore, it may be possible that the existence of chronic toxemia (be it trachoma or other irritant) produced partial blockade of the reticulo-endothelium; its functions were decreased and finally ceased. Since reticulo-endothelium is the principal regulator of protein

metabolism, conditions may arise causing a change in local chemical process of tissue so that normal proteins brought by the blood may assume a new chemical structure in the form of amyloid.

#### BIOCHEMISTRY

Hirschfeld, in 1882, was apparently the first to produce amyloidosis in the experimental animal. This was repeated and confirmed by Jaffe. Rokitansky, as far back as 1885, formulated the concept that the presence of amyloid substance is due to infiltration or deposit of an abnormal substance from the blood stream into the reticulo-endothelial system. Pearlman<sup>14</sup> says the nature of amyloid substance has remained a matter of considerable controversy. The most widely accepted view is that expounded by Krakow, who, in 1897, described amyloid as a combination of protein with chondroitin-sulfuric acid. Perla and Gross<sup>14</sup> reported that this was contradicted by Hanssen, who found no chondroitin-sulfuric acid. Eppinger found purines, diamino-acids, much tyrosine, and no carbohydrates.

Grayzel<sup>15</sup> and his co-workers believe that amyloidosis is probably the result of an endogenous protein metabolic disturbance. When the rate of formation of these catabolic products exceeds the ability of the tissues to dispose of them, amyloid appears. Amyloid deposition has been produced experimentally in several animal species by repeated injection of bacteria, sterile bacterial toxins, and non-toxic proteins. Among the bacteria, staphylococci seem to be the organisms of choice for the experimental production of amyloidosis. Among the toxins, diphtheria toxin is very effective, as has been repeatedly shown by the frequent occurrence of amyloid disease in horses used for the production of antitoxin. Relatively nontoxic material such as sodium caseinate, horse serum, and human serum will

produce amyloid disease in mice if the materials are repeatedly injected over a period of several weeks. Amyloid frequently appears in the organs of mice which have spontaneous or experimentally induced tumors. Some investigators have claimed that amyloid disease will develop in mice maintained on a diet of nutrose or sodium caseinate. Turpentine with production of sterile abscess may call forth amyloid reaction. It would seem likely that under certain conditions a fundamental disturbance in protein metabolism may occur which results in this abnormal deposition of an unusual protein. It would be interesting to investigate whether the diet plays any role in such a disturbance in human beings.

Letterer<sup>16</sup> suggests in primary amyloidosis the involvement of an antigen-antibody reaction, but in the reverse sense as compared with the reaction presumed to exist in the secondary form of amyloidosis. Fowler<sup>17</sup> believes that amyloid is apparently a transformation product of tissue protein which is deposited in soluble form. It is always extracellular and is transported to the organ or tissue rather than synthesized *in situ*. Composition of the material has not been accurately determined, though it is known that starch and cellulose, from which the term amyloid is derived, are not present. Reimann and Eklund<sup>8</sup> found that hyperproteinemia precedes amyloid deposit in animals, and they consider this the abnormal substance in the blood stream. The lack of unlimited power of the organism to dispose of nonutilizable split protein products is compensated for to a certain extent by the phagocytic power of the reticulo-endothelial system. Eventually a point is reached, however, where this system can no longer undergo hypertrophy and hyperplasia, and decompensation of phagocytosis occurs. Increasing masses of material accumulate intra-

cellularly and finally the cells burst to form extracellular deposits. While hyperproteinemia and the reticulo-endothelial system undoubtedly play a role in the production of amyloidosis, it is not clear whether the hyperproteinemia is a primary factor or merely mirrors a more fundamental process.

Hass and Schulz<sup>18</sup> undertook to test the hypothesis of Letterer that amyloidosis is due to an antigen-antibody reaction by attempting to isolate the antibody protein from the amyloid matrix. Unfortunately, there is no satisfactory method for dissociating specific precipitates composed of protein antibody. For this reason, it is improbable that the two proteins they obtained in their experiments represent unimpaired dissociated antigen-antibody. They isolated three types of amyloid which in spite of their differences in composition disappeared from the tissues in phosphate buffer solutions at pH 11 and remained in the tissues in phosphate buffer solutions at pH 10. As amyloid disappeared from the tissues two proteins appeared in the solvent. One protein (A) comprised about 90 percent of the total protein. The second protein (B), which was always present in small amounts, had different properties. Inasmuch as fraction B was incapable of combining with fraction A to form an insoluble precipitate at neutrality, and inasmuch as they believed that amyloid is a precipitate which forms a physiologic neutrality in the tissues, an unknown component which acts on fraction A *in vivo* in a way comparable with that of acetic acid *in vitro* is a desirable part of the model.

Rybnikova<sup>12</sup> tells of an interesting theory by Wichmann, which represents the process of amyloid formation in the following manner: Owing to the toxic disturbance of the cellular metabolism the function of the cells is impaired to such

an extent that they are unable to assimilate the albumin brought by the blood. This surplus of albumin is deposited in the interstices, and there under the influence of some ferment secreted by the cells or some other unknown cause is transformed into amyloid.

Grayzel<sup>15</sup> and his co-workers, in experimenting on mice, found that inadequate or deficient diets do not accelerate the development of amyloidosis. Mice fed a synthetic and the so-called stock diet to which vitamins A and B were added showed definite evidence of retardation of the production and formation of amyloidosis.

#### DIFFERENTIAL DIAGNOSIS

Amyloid disease may involve not only palpebral conjunctiva, but also the bulbar conjunctiva and the cornea. The process may be diffuse, or may assume the aspect of a well-delineated tumor. It is to be differentiated from hyalinization of the eyelid, tarsitis syphilitica, fatty degeneration, as well as various neoplasms, benign or malignant, diffuse lymphoma, plasmoma, scleroma, lymph- and hemangioma, and forms of sarcoma. Only histopathologic examination of the tissue determines the real nature of the disease.

Intravenous injection of Congo red is the specific test for the presence of amyloid. This simple clinical method for the diagnosis of amyloidosis was first described by Bennhold, in 1923. Among normal persons, 19 percent of the dye disappeared from the blood stream in one hour after injection, whereas among patients with amyloidosis 40 to 100 percent of the dye was found to have disappeared. This observation has been confirmed by many observers. Waldenström<sup>19</sup> was able to take specimens from the liver for biopsy with a specially made trocar, and by this method he was able to follow the development, reabsorption, and complete disappearance of the dye in the liver.

Friedman and Auerbach<sup>20</sup> have recently published an improved method of Congo-red injection for diagnostic testing. One might hesitate to use it in a case of conjunctival involvement, because of the prolonged retention of the dye in amyloid tissue, unless surgical removal of the involved tissues is contemplated.

Hyaline degeneration has been considered by several observers—Kubik,<sup>21</sup> Ernyei,<sup>22</sup> Leo<sup>10</sup>—as an early stage of amyloidosis.

Kreibitz<sup>23</sup> stated that there was no connection between amyloidosis and plasmocytoma as these diseases are due to entirely different reactions of the organ. There are no well-defined cases in which both of these conditions appeared simultaneously. Trachoma was almost always present in plasmocytoma, and relatively few cases of trachoma developed amyloidosis.

#### TREATMENT

Excision of the tissue involved in amyloid disease of the conjunctiva, either entirely or in part, is the method of treatment universally advised in the reports published in various countries. At times where the denuded area is extensive, grafts of mucous membrane from the mouth have been successfully applied. Many authors report that total ablation is not necessary, as they have found the remaining amyloid tissue undergoes retrogression.

The reports in general medical literature of amyloid disease being cured (especially in tubercular patients by prolonged administration of liver, powdered or fresh), a case of cure with only symptomatic treatment reported by Halbein,<sup>24</sup> and Waldenström's<sup>19</sup> report of his ability to show that complete disappearance of amyloid is possible in man despite extensive infiltration of the liver, influenced me to treat my patient on the theory

that amyloid formation in the conjunctiva is a deficiency rather than a degenerative disease.

According to Dalldorf,<sup>25</sup> ascorbic acid is an essential nutrient required for the normal deposition and maintenance of intercellular substances. This includes the collagen of all fibrous tissues and of all nonepithelial cement substances (the intracellular material of the capillary wall, cartilage, dentin, and bone matrices).

During vitamin-A deficiency the Kupfer cells become swollen and degenerate. It is quite possible that a part of the effect of vitamin-A deficiency on infectious diseases is due to this involvement of the reticulo-endothelial system (Eddy and Dalldorf<sup>26</sup>).

The patient cited in this paper has been given fresh liver over a period of many months, followed by vitamin C and later by vitamins C and A, with a resultant slow regression of the disease.

#### CONCLUSIONS

Amyloidosis may manifest itself in the conjunctiva as a primary and, perhaps, as a secondary disease. The fact that most cases reported have followed or complicated trachoma need not necessarily mean that the trachoma is a factor in the development of amyloid, for the majority of trachoma cases do not develop amyloidosis. The geographic location of most cases of eye involvement—that is, the Baltic states, Russia, Japan, and China, where deficiency diseases are more prevalent—would indicate that this might be a factor.

There is no single pathologic criterion upon which a diagnosis of primary amyloidosis can be made. The absence of preceding suppurative disease; the lack of evidence of amyloidosis in the internal organs commonly involved; the presence of amyloid in smooth or striated muscles, especially in the cardiovascular system,



gastrointestinal and genito-urinary tracts, tongue, more rarely in the alveoli of the lungs, and the sebaceous and sweat glands—all sites of primary amyloidosis; the atypical staining reactions to Congo red and iodine sulfuric acid; and the nodule formation that is found in conjunctival cases are at present the only bases for diagnosing the primary form.

Biochemically, the process of amyloid deposit appears to be a disturbance in protein metabolism, due not to transudation of a protein substance formed in the blood stream, but to an endogenous protein metabolic disturbance, in which the rate of formation of catabolic products exceeds the ability of the tissues to dispose of them.

Histopathologically, most evidence points to primary involvement of the phagocytic reticulo-endothelial cells, whose location is exactly in the places where amyloid is constantly seen. The

changes begin in the connective tissue of the tunica adventitia of the smaller arteries.

The Congo-red test is diagnostic, but should not be given in cases of eye involvement because of the retention of the stain in the tissues, unless surgery is to be done immediately. Iodine, Congo red, and crystal violet stains give characteristic coloring to amyloid material.

The only treatment of eye cases reported is surgical removal of the amyloid diseased tissue.

Definite, but slow, regression of the amyloid process in the author's case treated first by ingestion of fresh liver, later by vitamins A and C, would suggest the disease is due to a deficiency.

It might be desirable to abandon the term degeneration entirely in regard to amyloid formation in the tissues and to refer to the condition as amyloid disease.

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## CLINICAL EFFECTS OF THE LOCAL USE OF SULFONAMIDES ON THE EYES

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The local use of sulfonamides for the treatment of pathologic ocular conditions is based on the fact that these drugs are relatively innocuous when they come in contact with the ocular tissues, as was demonstrated in *anima vili* (rabbits) in 1938 by Rambo<sup>25</sup> and clinically proved later by many other authors;<sup>16</sup> it was also proved that sulfanilamide readily penetrates into the ocular globe with topical use, as do sulfapyridine and sulfathiazole; also sulfadiazine when iontophoresis is used or when an agent capable of breaking superficial tension is employed beforehand. Any of the four sulfonamides mentioned above are efficacious in the treatment of pathologic conditions of the conjunctiva and cornea, whether they are used in powder or ointment form. Local use of azosulfonamides, however, is not plainly justified, for this drug is transformed into sulfanilamide only within the human organ-

ism, and the favorable clinical results that have been reported should merely be compared with those obtained by the use of ordinary nonirritating collyria (Bellows<sup>5</sup>). Another considerable advantage of the therapeutic use of sulfonamides by local application is that the quantity of the drug entering the organism is practically negligible, the desired concentration being obtained only in the affected region, this being much greater than any concentration obtainable by any other means of administration; moreover, the time spent in obtaining the desired concentration is very much reduced.

According to Thygeson<sup>43</sup> it seems probable that the topical use of sulfonamides in ocular therapeutics will largely supplant the oral administration, because in the future it will be possible to use drugs with a highly active local effect, the toxicity of such drugs making their

use unadvisable *per os* or parenterally.

The local use of the sulfonamides in ocular therapeutics, however, was not accepted at once. Some years after the oral and even parenteral use of these drugs had been accepted in the treatment of ocular diseases, references to their local use were rare. This may be explained by the fact that the sulfonamides are only slightly soluble in water, which is the base ordinarily used for collyria. Sulfanilamide reaches its maximum concentration at less than 1 percent (0.8 percent) and at this concentration the collyria were not really very efficacious when instilled, ocular baths giving better results (Mengel<sup>24</sup>). It was necessary to resort to insufflation of the drug in powdered form (P'an<sup>20</sup>), but since this was not well tolerated, administration in this form was really impractical. Subconjunctival administration was then tried (Paton<sup>31</sup>); later came the ointments, the preparation of which at first did not give satisfactory results. These were followed by sodium salts of the various sulfas, their solubility in water being much greater; but a high pH was needed, making the collyria in question irritating. This step was followed by local administration with iontophoresis, which allows a rapid penetration of large quantities of sulfa into the ocular tissues. Although the prior use of agents capable of breaking the superficial tension of the cornea is still in its experimental stage, it promises to open up new means of the local application of the sulfas in the treatment of ocular diseases.

#### ACTION OF THE SULFONAMIDES APPLIED DIRECTLY TO THE OCULAR TISSUES

The action of sulfonamides is known to be bacteriostatic and not truly bactericidal. On accepting the hypothesis that the sulfas act by affecting the para-aminobenzoic acid, one must take into consideration, in their local therapeutic use, that

the anesthetizing collyria have structural formulas similar to the structure of that acid and that therefore their simultaneous use with the sulfas will hinder their respective action. In the same way and according to the same theory the existence of abundant secretion might also hinder the local action of the sulfas.

One might think that the sulfonamides would have an inhibiting effect on the phagocytic action of the white blood corpuscles. Experiments carried out on animals, outside the field of ophthalmology, demonstrate the opposite: among rats inoculated with agents of gas gangrene, phagocytosis was greater in those that had been given sulfonamides locally in the wounds.<sup>30</sup>

However, experiments carried out by Bellows<sup>4</sup> show that corneal reepithelization in rabbits took, on an average, 5.1 days, whereas in rabbits treated locally with sulfonamides the period of epithelization was 13.6 days.

Berens, Gara, and Loutfallah's<sup>6</sup> observations agree with those of Bellows, the former authors having found that the period of cicatrization of corneal wounds in rabbits treated with ointments with or without sulfonamides was longer than in those which received no treatment. These authors also found that when the wounds were infected with *Staphylococcus aureus*, the percentage of cures was greater in the eyes treated with 5-percent sulfa ointment.

Bellows<sup>4</sup> states that local application of sulfonamides to the cornea not only retards cicatrization but causes the formation of vascularized scars.

The clinical inference from these facts is that the sulfonamides should be applied locally to corneal wounds only when there is suspicion of infection. Conversely, according to personal observations in clinical practice, the aforementioned experiments can be confirmed, for in infected

ulcers of the cornea the use of sulfonamides should be suspended when the ulcer by its aspect shows that it is regressing, so that by continuation of treatment the drug will not retard cicatrization.

#### METHODS USED IN LOCAL SULFONAMIDOTHERAPY

The sulfonamides used topically in ophthalmologic therapeutics are sulfanilamide, sulfathiazole, and sulfadiazine, sulfapyridine being used much less frequently. Sulfanilamide is soluble in water up to 0.8 percent and this aqueous solution has been used. Sulfathiazole and sulfadiazine are less soluble in water and for aqueous collyria their sodium salts are employed. Sodium sulfacetamide, from which solutions up to 30 percent can be obtained, has been widely used for topical applications in ophthalmology (Pillat<sup>32</sup>). Tolerance of these collyria is good; generally there are no irritative phenomena. It is advisable that they should be isotonic. The collyria may be instilled frequently at short intervals (every 5 seconds, 60 times) or used as an ocular bath for 3 to 5 minutes, repeated every 2 hours. Liquid collyria of sulfonamides may also be used for irrigations of the conjunctival cul-de-sac, these irrigations being repeated more or less frequently according to the case, at intervals of from 15 minutes upward between irrigations (Rein and Tibbetts<sup>37</sup>). Pure sulfonamides can be used by insufflation, dusting or insufflators being used for this means of administration.<sup>43</sup> Insufflations are generally given every three hours. This method of application is useful for patients in hospital, but is difficult for use with out-patients.

It is necessary to keep in mind that due to the mode of action of the sulfonamides in inhibiting the development of the germs, without, however, destroying them directly, a continuous local action is in-

dispensable, so that instillations should be repeated frequently, and insufflations should be given so that there will always be a reserve quantity of sulfonamides to be dissolved by the tears.

Sulfonamides when administered by insufflation, however, do not seem to be completely innocuous, and irritative phenomena resulting from this method of using the drug have been reported (Guyton and Woods<sup>15</sup>). Bellows<sup>4</sup> also verified the appearance of chemosis and coloration of the corneal epithelium after application of powdered sulfonamide for two hours. Sulfanilamide and sulfadiazine seem to be better tolerated in local application than is sulfathiazole. In any case it is always preferable to porphyryze the drug or to use the microcrystals. (Thygeson,<sup>43</sup> Leopold and Scheie<sup>2</sup>).

Ointments present several advantages over the collyria in the local application of the sulfonamides to the lids, conjunctival cul-de-sac, and cornea, because as the sulfonamides are but slightly soluble in water, aqueous collyria of their sodium derivatives, which are sometimes irritating due to their alkalinity, are generally used, whereas in the ointments pure sulfonamides can be employed. Besides this the ointments are generally well tolerated by the patients, whose only complaint is the disturbance of visual acuity caused by the extremely thin layer of unctuous substance that forms on the cornea. Emulsions, according to Thygeson and Braley,<sup>44</sup> are advantageous in that the drug is released more rapidly, but their drying properties make them irritating when used on the lids. Ointments also allow for a more prolonged action of the drug. Thygeson and Braley found that the base which kept its drug-diffusing property the longest was hydrous wool fat; evident traces of the drug were present in the cornea of rabbits 60 minutes after only one application of 5-percent sulfa-

thiazole ointment in this base. This finding demonstrates that with an adequate base, ointments can be used less frequently than the aqueous collyria and yet have a similar effect.

Ointments must have certain requisites to make their administration effective, these requisites varying according to whether the ointment is to be used on the skin or conjunctiva. Therefore, according to Pillsbury, Wamrock, Livingston, and Nichols<sup>33</sup> ointments for use on the skin of the lids should retain the drug in a finely divided state at the site of application for the longest possible time period; (2) allow close contact of the sulfa with the site of infection; (3) be miscible with mucous and purulent secretion; (4) not form a tight waterproof layer under which bacteria could develop; (5) allow for easy removal of the bacteria found in the crusts. These authors found that purely fatty bases such as petrolatum, hydrous wool fat, and the like, all have the requisites required by item 1 but do not meet the demands for the other items; they state that they prefer an emulsion in which the sulfonamide is first dissolved or kept in suspension in water, this suspension or solution being afterward emulsified with the greasy base. These emulsions permit a more intimate contact between the drug and the affected part, they mix with secretions and, owing to the lessened superficial tension, a better release of the drug to the tissues is obtained. For the conjunctival cul-de-sac the use of a hydrous-wool-fat base seems to be preferable. Elvin<sup>12</sup> recommends the following formula: To 4 parts of sodium alginate add 75 parts of boiling water; emulsify and strain, and then stir until cool. Add 16 parts of anhydrous wool fat, 78 parts of white petrolatum, and 1 part of sodium chloride dissolved in 4 parts of water. This base was found to be the best for the use of sulfanilamide or sulfathiazole.

The breaking of superficial tension beforehand by the use of detergent preparations permits a far greater penetration through the cornea and aqueous when sulfonamides are applied locally. Detergent preparations are understood to contain the necessary ingredients for lowering superficial tension, thus permitting an increase in penetration. These preparations consist of molecules containing polar and nonpolar groups. As a result these molecules are concentrated on the surface of the cornea and orient themselves so that the polar group comes in contact with the epithelium and the nonpolar portion is directed to the surrounding media. Consequently interfacial tension between the surrounding media and the epithelium is reduced, causing increased penetration not only of the detergent but also of the surrounding elements. It is known that one of the reasons of the difficulty for the penetration of the sulfas into the cornea is due to their polar nature (Swan and White<sup>42</sup>). Therefore a previous application to the cornea of a preparation capable of reducing superficial tension would logically increase penetration of the sulfas.

In 1942, Alvaro and Silva,<sup>1</sup> assisted by Prof. Q. Mingoja for the chemical part (in a paper presented before the Section of Ophthalmology of the American Medical Association) demonstrated that after instillation of 1 drop of a 15-percent aqueous solution of sulfacetamide 60 times in succession at 5-second intervals into rabbit eyes, a concentration of 2.23 mg. of sulfa per 100 c.c. was obtained in the aqueous after half an hour. However, if a drop of dioctylsulfosuccinate was instilled previously and the same experiment repeated, the concentration in the aqueous rose to 8.68 mg. per 100 c.c. Bellos and Gutman,<sup>3</sup> also experimenting with rabbits and using various preparations to lower superficial tension, such as dioctylsulfosuccinate (known by the com-

mercial name of "Aerosol OT"), isopropyl-naphthelene sodium sulfonate ("Aerosol OS"), higher secondary alcohol sulfate ("Tergital 4.7"), synthetic primary alcohol sulfate ("Tergital 0.8"), oleyl alcohol ("Ocenol KD"), high-molecular alkyl, dimethyl and benzyl ammonium chlorides ("Zephiran"), were able to increase the penetration of sulfathiazole in the aqueous in similar proportions. Zephiran was the only agent with which results were not so satisfactory. These authors verified that with 0.2-percent detergent solutions ("Aerosol OS") they were able to obtain an increase in penetration of the sulfa in the aqueous and with 10-percent solutions saturation was attained. Solutions of these detergents of less than 2 percent do not seem to harm the cornea, and this leaves a wide-margin of safety if detergent solutions of 0.3 to 0.5 percent are used, for their effect on the increase of penetration is already great.

The existence of vasodilatation and inflammatory conditions of the cornea facilitates corneal penetration, as does also application of local heat for the same reasons.

Owing to the fact that sulfonamides penetrate into the aqueous in large quantities when administered subconjunctivally, their clinical use by this method was established. Paton<sup>31</sup> employed subconjunctival injections of neoprontosil in 0.2 to 0.3 c.c., using 2.5- and 5-percent solutions. Good results were obtained and local inflammatory reaction was not very great. This method of administering the sulfonamides locally in ocular therapeutics has not been generally favored owing to the fact that similar or even better results can be obtained by the use of iontophoresis without the inconveniences of subconjunctival injection.

Leduc, in 1900, suggested making chemical agents penetrate into the human

organism by means of an electric current. Application of this method to the visual apparatus seems to have been done by Wirtz in 1908, but it was Cantonnet who, in 1927, reviewing the literature on the subject and adding his own theories, established this therapeutic method in ophthalmology.

The passage of the galvanic current to the cornea, whether by application of the negative pole or of the positive pole, causes a decrease of tension in the globe, which has been verified by Myerson and Thau.<sup>28</sup> This decrease is more pronounced when the negative pole is applied to the cornea, is independent of the application of chemically active agents, and takes place even when distilled water is used. Myerson and Thau explain this decrease in tension as the result of a vasodilatation or some more complex chemical action. In any case the passage of the galvanic current stimulates the parasympathetic system, as can be seen by the contraction of the pupil and narrowing of the palpebral fissure.

In iontophoresis with sulfonamides the negative pole is applied to the cornea and the positive pole to the nape of the neck. We have found in a series of patients undergoing iontophoresis for various reasons that there is invariably a decrease in ocular tension, very variable, however, for each individual and even in the same individual from day to day. This decrease was from 10 mm. Hg to 1 or 2 mm.

For iontophoresis small glass cups with a metallic electrode at the bottom may be used. The patient, with his head down, submerges the cornea in the liquid contained in the cup; or a glass tube open at the ends may be applied to the limbus, filled with an adequate solution and an electrode dipped into the liquid; or a cotton-wool pledget soaked in the solution may be placed on a metal disc connected with the negative pole of the ap-

paratus, the wet cotton wool being made to come into direct contact with the cornea. With this last method it is generally necessary to anesthetize the cornea, which, as we have seen, is inconvenient, and also there is a danger of trauma.

In order to combine the action of the drug which penetrates into the tissues by means of the galvanic current and the mechanical action of massage, we have used an adequate electrode covered with gauze and soaked in the solution indicated. With this we massage the palpebral conjunctiva in cases wherein such massage is necessary, as will be seen further on.

The current used is 1 to 2 Ma. With 1 Ma. Boyd<sup>7</sup> found that penetration of sulfathiazole in a 5-percent solution in the cornea and aqueous was three times greater than that obtained with an ordinary ocular bath of equal duration. With 2 Ma. increase of penetration was 9 times greater in the aqueous and 10 times greater in the cornea. The increase of the concentration of the sulfonamide solution determined an increase in concentration of the drug in the tissues, which, however, was not proportional to that increase. Boyd<sup>7</sup> found no corneal lesion caused by iontophoresis with sulfathiazole solution.

Von Sallmann,<sup>48</sup> experimenting with rabbits, found that the penetration of sulfadiazine by iontophoresis was even greater than that obtained by Boyd with sulfathiazole; penetration of sulfacetamide and sulfapyridine, however, was less. Von Sallmann also found that the penetration of the drug is very rapid, reaching a maximum concentration in 15 minutes, remaining in all the tissues and liquids of the anterior segment of the globe for four hours in a bacteriostatic condition.

For iontophoresis we have regularly been using solutions of sodium sulfacetamide or sodium salts of sulfanilamide in

strengths of 5, 10, and 15 percent in various cases. The clinical results observed, which are given further on, justify our belief in the effective penetration of the drug by this method of administration. Serious irritative phenomena were not observed, these applications being well tolerated by the patients. We use a 2-Ma. current and the application is of 2 to 5 minutes' duration, according to the case.

There are other methods of applying sulfonamides locally to the visual apparatus, but their use is less generalized. Igersheimer<sup>17</sup> refers to a case of traumatic purulent iridocyclitis with indication for enucleation due to the pronounced irritative phenomena and slight perception of light, in which, besides the classical therapy with heteroprotein, he injected a solution of 0.8-percent sulfanilamide into the anterior chamber. Inflammation disappeared, and a final visual result of 20/40 was obtained after iridectomy and extraction of cataract had been performed. Laval,<sup>20</sup> encouraged by this case history of Igersheimer, presents a case of a patient operated on for cataract in which, due to vomiting, gastric liquid entered the conjunctival cul-de-sac of an eye wherein the anterior chamber was open; in order to avoid possible infection, an irrigation of the anterior chamber with a 10-percent solution of sodium sulfadiazine was performed. No irritative phenomena of any kind were observed. Puga<sup>24</sup> also refers to excellent results in a case of abscess of the vitreous in which he substituted 0.6 c.c. of vitreous with an injectable solution of prontosil rubrum. In another case of recurrent uveitis with cataract the inflammatory phenomena ceased after intravitreous injections of the same drug.

Lavage of the lacrimal sac with sulfonamide solutions has also been used. Leopold and Scheie refer to having used a 5-percent aqueous suspension of sulfathiazole and sulfapyridine with microcrystals,

without causing irritation and with good therapeutic results. Puga<sup>34</sup> also mentions having done the same with neoprontosil.

Local administration of the sulfonamides does not exclude the oral or parenteral use of the drug. Its use may be supplementary, taking advantage of the rapidity of penetration of the sulfas into the eye, when the application is local, in order to obtain an immediate bacteriostatic effect whilst waiting for the drug administered by mouth or parenterally to reach the concentration necessary to produce a therapeutic effect after a few hours. When the sulfonamides are used orally or parenterally and locally it is not necessary to consider the quantity of the drug absorbed locally, for even if a maximum penetration is obtained there is no danger of a toxic effect.

It has been found, and we have already referred to the fact, that an increase in the body temperature favors absorption of the sulfonamides and also their bacteriostatic action; there is, therefore, no reason to contraindicate the simultaneous use of therapeutic agents which cause an increase in temperature and of sulfonamides; rather, simultaneous administration of foreign proteins, vaccines, toxoids, and the like, with the sulfas should always be indicated when necessary.

According to Thygeson<sup>43</sup> studies by Schmelkes and Wise<sup>40</sup> show that azochloramide and oxidizing agents increase the bacteriostatic power of the sulfonamides, so that something can be hoped for from this source, although so far clinical experiments are lacking.

With the local use of the sulfonamides no phenomena of general poisoning need be feared, for the quantities of the drug absorbed are truly very small. There are cases, however, in which patients with a great sensitivity to the sulfas showed local allergic manifestations when collyria or ointments containing sulfonamides are

applied. Howard Morrison<sup>26</sup> refers to a case of allergic blepharoconjunctivitis due to the use of an ointment of sodium sulfathiazole. When the use of the drug was suspended the symptoms of irritation disappeared, but reappeared in one eye only in which ointment had again been applied, this time of sulfathiazole. Thygeson and Braley<sup>44</sup> also describe several cases of conjunctival inflammation with dermatitis of the lids, pruritus, and conjunctival eosinophilia. They also observed similar cases when sulfanilamide, never when sulfadiazine, was applied locally. Personally I have observed several cases of allergic irritation caused by the local use of sulfonamide collyria and ointments, specifically with the use of sodium sulfacetamide and sulfanilamide, whether in the form of aqueous collyria or ointment to be applied in the conjunctival cul-de-sac and on the skin of the lids. All authors are unanimous in stating that with suspension of the local use of the drug, inflammatory symptoms rapidly disappear, leaving no permanent damage.

#### THERAPEUTIC INDICATIONS

As the sulfonamides may frequently cause toxic manifestations of a certain seriousness, their use *per os* or parenterally or intravenously should not be prescribed without due reason. Owing to the facility with which penetration of the drug is obtained locally, this method is indicated as the method of choice when the desired effects can thereby be obtained. There are cases, however, in which paradoxically results are not so encouraging with local as with oral methods.

#### DISEASES CAUSED BY VIRUS

Regarding ocular virus diseases, local treatment with the sulfonamides is limited to granular conjunctivitis and inclusion conjunctivitis. In the latter this is the



treatment of choice,<sup>45</sup> good results having been obtained especially in children. Generally, 5-percent sulfathiazole ointment in the conjunctival cul-de-sac 6 times a day is used.

Since the sulfonamides were found to be of great value in the treatment of trachoma,<sup>10</sup> several authors have sought to obtain good results with local application of the drug. Amaral<sup>2</sup> in 1939 states that he obtained good results with massage of the palpebral conjunctiva of trachomatous patients with a 2-percent sulfanilamide ointment. Cosgrove,<sup>11</sup> in 1940, also mentions good results in a series of patients undergoing treatment consisting of the instillation of an 0.8-percent sulfanilamide solution 4 to 6 times a day. Results were equivalent to those obtained in another series treated with sulfa orally. Subconjunctival injections of neoprontosil<sup>8</sup> have also been used with good results, according to Paton<sup>31</sup>; Morante<sup>25</sup> has used insufflations and massage with powdered sulfanilamide. Victoria and Artigas have used a collyrium of sulfathiazole (see Sená<sup>41</sup>). The majority of authors, however, advise the use of collyria of sulfanilamide, but the number of enthusiasts for the local treatment of trachoma with the sulfonamides is relatively small, treatment by mouth being advocated as a rule.

Personally, and in the Eye Clinic of the Escola Paulista de Medicina, we usually associate the administration *per os* of the sulfonamides with local treatment with collyria containing 15-percent sodium sulfacetamide. This treatment is given for 2 to 3 weeks until regression of the inflammatory phenomena is observed, then treatment *per os* is suspended, and massage with an electrode soaked in a 5-percent solution of sulfacetamide with a galvanic current of 2 Ma. is instituted. These massages aim at destroying the follicles and at the same time guarantee

a sufficient concentration of sulfonamide in the affected tissues. Ionization massage is given for 2 to 3 minutes and repeated daily. Series of 20 massages are given at intervals of 10 days, and at the end of each series the patients are reexamined in order to see whether treatment should be continued or not. Results are generally very good, the active signs of trachomatous infection disappearing together with the follicles.

It is obvious that at least a partial substitution of the general treatment by local treatment would be of great advantage, as this would permit a much more universal use of the sulfonamides in the treatment of trachoma.

#### DISEASES CAUSED BY BACTERIAL INFECTION

Gonococcic conjunctivitis, which has been effectively treated by sulfonamides administered orally, has also been treated locally by some authors. Mullen<sup>27</sup> used washes of a 0.2-percent solution of sulfathiazole repeated every 10 minutes. Rein and Tibbetts<sup>37</sup> used irrigations of a solution of sulfanilamide with very good results, and Panneton,<sup>30</sup> using powdered sulfanilamide, also obtained very good results. The seriousness of this ocular disease, however, seems to justify running the risk of using the sulfonamides *per os*, and perhaps it would be wiser to advocate a mixed treatment in cases of gonococcic conjunctivitis, as with this method the doses of sulfa taken orally can be reduced sooner. Sulfadiazine seems to be the sulfonamide of choice for local application in these cases (Thygeson<sup>43</sup>).

Pillát<sup>32</sup> successfully used a 10-percent collyrium of sodium sulfacetamide at 30-minute intervals in gonococcic conjunctivitis of the newborn.

I have used instillations of a collyrium of this same drug in a 15-percent isotonic solution, instilling one drop at half-hour.

intervals, with very good results. Once a day the same solution is instilled 60 times at 5-second intervals, this guaranteeing a good penetration of the drug through the cornea. This treatment may or may not be associated with administration of sulfonamides *per os* and protein therapy according to the gravity of the case.

In ocular diseases caused by various types of streptococcus the sulfonamides are of great value. Conjunctivitis caused by streptococcus and corneal disturbances of the same origin can also be influenced by the sulfonamides applied locally, repeated mention being found in the literature as to the good results obtained by application of the drug.

The action of the sulfonamides is much more efficacious, specifically sulfathiazole, in ocular diseases of staphylococcal origin. It is known that the staphylococcus is the germ that is probably responsible for the greatest number of ocular disturbances of bacterial origin: hordeolum, which is nearly always of staphylococcal origin, and blepharitis, which is frequently caused by the same bacteria, are benefited by the local use of 5-percent sulfathiazole ointment, the action of the other sulfonamides being far less effective and sometimes nil. Thygeson<sup>47</sup> mentions good results obtained in the treatment of blepharitis with the use of 5-percent sulfathiazole ointment applied 6 times daily at regular intervals in the form of massage of the palpebral border. In recent cases the treatment is always effective, whereas in old chronic cases it is sometimes necessary to associate other therapeutic measures. In the latter cases epilation of the infected cilia and expression of the meibomian glands are sometimes essential. My own clinical experience with a large number of patients thus treated within the last two years has confirmed this observation. Also in cases of staphylococcal impetigo and infected eczema of

the lids sulfathiazole ointment has given excellent results.

Corneal ulcers of staphylococcal origin usually heal better with the use of powdered sulfadiazine (Thygeson<sup>43</sup>) applied to the conjunctival cul-de-sac at intervals of 3 or 4 hours. It is always necessary in these cases to eliminate the coexisting blepharoconjunctivitis in order to avoid recurrences. I have used iontophoresis of solutions of 5-percent sodium sulfacetamide in many cases of corneal ulcers of staphylococcal origin and results have invariably been good. I usually give applications of 3 to 5 minutes' duration with a current of 2 Ma. In cases of conjunctivitis caused by staphylococcus I have also used, and with very good results, instillations of collyria of 15-percent sodium sulfacetamide, repeating the instillations more or less frequently (every hour or at longer intervals) according to the evolution of the case. Robson and Scott<sup>48</sup> also mention having obtained good results with instillations of this same drug in concentrations of 2.5 to 30 percent in the treatment of conjunctivitis of various origins.

Chronic conjunctivitis constitutes a therapeutic problem that it is sometimes difficult to solve. From the bacteriologic point of view the germ most frequently found is the *Staphylococcus aureus*. Thygeson and Braley<sup>44</sup> with clinical experimentation found that the use of 5-percent sulfathiazole ointment was effective in the treatment of these cases as against the uselessness of the classical treatment. They also found that in cases wherein the *Morax Axenfeld* diplobacillus was present, treatment with zinc sulfate was useless until the staphylococcal factor was eliminated. Clinically we have found the treatment of chronic conjunctivitis by sulfonamides very effective, good results having been obtained with the application of collyria of 15-percent

sulfacetamide. In cases of chronic conjunctivitis it is very important to eliminate the foci of blepharitis, which are nearly always caused by the staphylococcus. These foci may lack subjective symptoms and objectively only a careful examination will show small scales, which are visible with a magnifying lens, on the roots of the lashes. It is therefore indispensable in cases of chronic conjunctivitis, in addition to applying ointment or collyria of sulfa to the conjunctival cul-de-sac, to apply this ointment also to the palpebral border.

One of the germs that most frequently causes acute catarrhal conjunctivitis is the Koch Weeks bacillus (*Haemophilus influenzae*). Experiments carried out *in vitro* by Guyton,<sup>14</sup> which have been clinically confirmed, show that the sulfonamides (sulfanilamide and sulfapyridine) have a favorable action in the treatment of this conjunctivitis. Thygeson and Braley<sup>44</sup> found that whereas with the staphylococcus, which is also a frequent cause of acute conjunctivitis, the action of the classical methods of treatment is manifestly inferior to that of sulfathiazole, with the Koch Weeks bacillus and with the pneumococcus the action of the classical medication and of sulfathiazole is more or less equivalent. Practically, we may deduce from this statement, the advantage of the systematic use of sulfonamides which in the worst hypothesis could only have an equivalent action to that of the best medication. My experience confirms that the use of 15-percent sulfacetamide is effective in the treatment of acute catarrhal conjunctivides caused by the Koch Weeks bacillus, by the pneumococcus, or by staphylococcus.

The pneumococcus causes ocular disturbances such as conjunctivitis, corneal ulcerations, dacryocystitis, and the like. Favorable results in the treatment of these conditions with the local use of

powdered sulfapyridine in corneal ulcers has been mentioned (Johnstone<sup>18</sup>). Due to the avascular nature of the cornea large concentrations of sulfonamide are necessary in order to obtain an effective bacteriostatic action against the pneumococcus, therefore iontophoresis with sulfathiazole or sulfadiazine is indicated. I have obtained very good results with iontophoresis with sodium sulfacetamide in cases of corneal ulcers due to pneumococcus. As the disease is of a serious character, however, I always associate oral administration of the drug and other therapeutic agents indicated, such as foreign-protein therapy.

Pneumococcic conjunctivitis (catarrhal, acute, or chronic) generally does not endanger the eye and responds equally well to the classical treatment and to sulfonamide treatment.

The pyocyaneus bacillus causes severe corneal ulcerations which lead to perforation and panophthalmitis within a few hours. Ocular manifestations of pyocyaneus infection although responding badly to ordinary treatment can be effectively treated with sulfadiazine iontophoresis (Von Sallmann<sup>48</sup>), by instillation of sulfacetamide collyria (Robson and Scott<sup>38</sup>), or by combined oral and local administration of sulfadiazine (Thygeson and Stone—ref. by Thygeson<sup>43</sup>). Sulfapyridine was used by Lepard<sup>22</sup> and by Joy<sup>19</sup> before the discovery of the other sulfas. In a serious disease such as ulcers of the cornea due to pyocyaneus<sup>9</sup> it is necessary to act quickly, therefore associated administration orally and by iontophoresis of the drug is recommended in order to obtain and maintain a concentration of sulfonamide which will check the growth of the germ.

Morax Axenfeld's diplobacillus causes conjunctivitis and corneal ulcerations which respond well to local sulfonamide treatment with 5-percent sulfathiazole

ointment.<sup>44</sup> I have used 15-percent sodium sulfacetamide with very good results in cases of conjunctivitis caused by this germ, and iontophoresis with a 5-percent sulfacetamide solution is also effective in the treatment of corneal ulcers of this same origin.

*Meningococcus* rarely causes conjunctivitis. Recently, however, Thygeson<sup>46</sup> mentioned a case of primary meningococcal conjunctivitis which responded well to treatment with sulfadiazine orally combined with applications of 5-percent sulfathiazole ointment every two hours.

The coli bacilli rarely cause pathologic disturbances in the eyes, but treatment with sulfonamides (sulfathiazole and sulfadiazine) applied locally should be the treatment of choice. Rare, too, are inflammations caused by the bacilli of the *Proteus* group or by the Friedländer bacillus. But either one responds well to local sulfonamide treatment.

Prophylactically, instillation of 15-percent sodium sulfacetamide has been found beneficial during the preoperative and postoperative period, the secretion found in the dressings after surgical operations being manifestly decreased, probably due to lesser irritation caused by this collyrium in comparison with other antiseptic agents.

Guyton and Woods,<sup>15</sup> who obtained good results with the prophylactic use of sulfadiazine orally in cataract extractions, mention having observed undesirable irritations due to the application of powdered sulfadiazine to the conjunctival cul-de-sac.

Igersheimer<sup>17</sup> relates the dramatic results obtained with injections of sulfanilamide into the anterior chamber in a case of purulent endophthalmitis. Bacteriologic examination of the purulent aqueous revealed nothing. With two injections of 0.2 c.c. repeated twice infection ceased. Previously, up to the time of

the injections the patient had been under the action of sulfonamide administered orally.

Puga<sup>84</sup> also mentions good results obtained from intravitreal injection of neoprontosil in a case of abscess of the vitreous. He also reports having obtained a cure of an ulcer with hypopyon following chronic dacryocystitis. After irrigation of the lacrimal sac with the same neoprontosil, the dacryocystitis disappeared and cure of the ulcer was effected within a few days.

The treatment of dacryocystitis with lacrimal-duct irrigation with sulfonamide solutions certainly causes an improvement and sometimes even a temporary cure of the infection, the secretion disappearing. Definite results, however, are less noteworthy, for if there is no permeability of the excretory lacrimal pathways; inflammation recurs within a short time. In cases wherein the pathways are permeable, however, irrigation with a solution of sulfacetamide or with other similar solutions effect very good results.

In acne rosacea, the lesions of the skin of the face may extend to the skin of the lids. Of an unknown origin, this disease responds unfavorably to various therapeutics. Generally, the external manifestations of the disease which cause the greatest discomfort to the patient are not really the result of the disease but of the staphylococcal infections that occur. For these cases Wise<sup>49</sup> recommends the use of 5-percent sulfathiazole or sulfadiazine ointment applied locally several times daily.

Adequate use of the sulfonamides in the treatment of ocular diseases, with attention to proper indication and in the doses which clinical experimentation has found advisable, is a decisive element of unquestionable value in the therapy of a large number of pathologic conditions of the visual apparatus. The possibility of

the effective local use of the sulfonamides in ophthalmology has opened up new fields, and in the future it is possible that the use of these drugs will be even more generalized.

### SUMMARY

The fact that the sulfonamides are almost innocuous to the ocular tissues when applied locally, their easy penetration when thus applied, the almost complete absence of symptoms of intolerance to this kind of sulfonamide therapy, and the great effectiveness with which the drug acts in several eye diseases make it probable that the topical use of sulfonamides will largely supplant their oral administration.

Sulfanilamide, sulfathiazole, sulfadiazine, and sulfapyridine, especially the former three, are of generalized use for topical therapy in ophthalmology. The fact that sulfanilamide is soluble in water only up to 0.8 percent and that the other sulfas are still less soluble explains why at first, when only aqueous collyria were tried, local sulfonamide therapy did not make headway. Insufflation of powdered and microcrystal sulfonamides, their local application in properly chosen ointments, the use of sodium derivatives, which are more soluble, the previous use of substances which break the surface tension and thus propitiate a larger penetration of sulfonamides through the cornea, the use of iontophoresis and other methods have been tried subsequently with good results and large concentrations of the drug in the ocular tissues are obtained, higher, indeed, than the concentrations achieved when oral or parenteral administration is used. Moreover, this high concentration is reached in a very short time. The possibility of combining local treatment of immediate effect and general treatment of delayed but constant effect is advantageous. Association of fever ther-

apy increases the penetration ration of the drug. So does local inflammation.

Since sulfonamides have only bacteriostatic action, it is essential that the drug be applied frequently; repeated instillations, application of suitable ointments, and iontophoresis appear to be the choice methods.

Phenomena of general intolerance for the sulfonamides during their topical use have not been mentioned so far. Local intolerance revealed by lid dermatitis and conjunctivitis has been mentioned; it always subsides as soon as the treatment is discontinued.

Therapeutic indication for sulfonamides locally in virus diseases is: in cases of inclusion conjunctivitis and trachoma. In the latter, combined simultaneous massage and iontophoresis of the palpebral conjunctiva with the electrode, thus effecting drug penetration and at the same time destruction of the folliculi mechanically, have given good results.

In gonococcic conjunctivitis good results have been reported from the local use especially of sulfadiazine and sodium sulfacetamide. The seriousness of the disease, however, justifies combined local and oral treatment. In cases of streptococcus, pneumococcus, and Koch Weeks inflammations of the eye, sulfonamides are effective but have not proved themselves better than the other therapeutic agents, except in cases of corneal involvement, where iontophoresis is paramount. But in blepharitis, conjunctivitis, and corneal involvement due to staphylococcus, the topical use of sulfonamides is far superior to any other treatment. Thus in conjunctivitis, in general, the local use of sulfonamides is justified as a routine treatment.

Ocular inflammation due to *B. pyocyaneus* has been treated with success with local applications of sulfonamides, especially with iontophoresis of sulfadiazine.

Inflammations due to *B. coli*, *B. proteus*, and *K. friedlanderi* have also responded favorably to local sulfonamide therapy.

Prophylactically, before and after ocular operations, the use of collyria of highly soluble sodium sulfacetamide has been advantageous.

Innocuous injections of sulfonamide solutions into the anterior chamber and

into the vitreous chamber have been reported, apparently with good clinical results.

Local sulfonamide therapy is very effective in a number of well-defined eye diseases, provided proper dosage and adequate means of administration are used.

*1151 Consolação.*

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## DACRYOCYSTITIS: THE PART PLAYED BY SYPHILIS IN ITS ETIOLOGY

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In the ophthalmologist's daily routine, inflammation of the tear-ducts is a fairly common finding. When a search is made for the underlying cause, it is usual to find that the trouble started, not in the lacrimal sac itself, but rather in the duct—because something had occurred to obstruct the duct. When any of the body's secretions are held back, multiplication of the retained bacteria is the regular result. The inflammatory condition thus induced, may, however, be due to any one of many causes; when it becomes chronic, it is often extremely difficult to control. Under such circumstances we must delve deeper into the etiology, for local measures of relief are of no lasting value if we do not know the precise nature of the infection with which we are dealing.

*Relation of lacrimal-tract infections to nasal disease.* The lacrimal apparatus, on account of its close relation to the nose, is likely to be involved in any disease condition affecting the upper respiratory tract. Because this fact is clinically established, rhinologists and ophthalmologists (if they are consulted) often assume, in any lacrimal-tract disturbance, that nasal-sinus disease is the underlying factor, and so make no further investigation.

*Congenital malformation.* Old-school ophthalmologists referred most pathologic conditions of the lacrimal apparatus to congenital malformation. The modern textbooks do not lay so much stress on anomalies of structure, but there is no doubt that malformed organs in any part of the body are more prone to disease than completely normal ones. Schnyder, writing in 1920 (which ranks him with

the moderns), gave examples of hereditary disease of the lacrimal apparatus which he demonstrated were dependent upon anomalies in the conformation of the nasal bones. Such anomalies can be passed on from one generation to another. Schnyder's argument was that the osseous portion of the lacrimal canal—that is, the lacrimal bone itself—the ascending portion of the maxilla, and the lacrimal process of the inferior turbinate—all being parts of the facial skeleton—have definite forms for races, families, and individuals, so may vary exactly as do the shapes of nose or temporal bones. If the lumen of the lacrimal canal is abnormally contracted because of bony malformation, individuals or families presenting this anomaly will be prone to have "watering eyes."

*Congenital lymphoid-tissue hypertrophy.* Other writers—for example, Meller—incriminate lymphoid tissue rather than bony structures. If an overgrowth of such tissue exists—and this tendency to lymphoid-tissue hypertrophy may well be inherited—any infection or other stimulation might cause swelling which would close off the lacrimal canal and so induce dacryocystitis.

*Determination of the active infective agent.* But even if we accept these etiologic concepts we are still confronted with the necessity of determining the active causal factor. My attention was particularly drawn to this phase of the subject by two patients who came under my care on account of a dacryocystitis on the left side. The histories are as follows:

CASE 1. Because of a painful swelling of the



left eye and left side of the nose, a housewife, aged 54 years, presented herself for examination. She stated that for three months previously there had been a discharge of pus, with periodic swelling at the inner canthus on the left side. The swelling had been opened and drained several times, but the lesion had remained obstinate to treatment.

*Examination* showed the vision to be: R.E. 6/7.5; L.E. 6/12 (uncorrected). There was swelling at the left inner canthus, so great as entirely to obliterate the outlines of the lacrimal fossa. The swelling on the left side of the face extended downward as far as the mandible, and there was preauricular and cervical lymphadenitis. Routine laboratory examination reported a positive Kahn test, and, guided by this indication, intensive antiluetic therapy was instituted, with hospitalization. The patient was discharged cured at the end of 10 days, although two months later it was necessary to perform a dacryocystorhinostomy in order to do away with the troublesome epiphora.

CASE 2. A laborer, 41 years old, came complaining of a periodic swelling of the left side of the face, especially at the left inner canthus. In the past he had been able to reduce the swelling by massage, but at the last attack the affected region had been too painful to permit manipulation, which induced him to seek relief.

*Examination* showed vision in each eye to be 6/30, but with his present correction, 6/7.5. There was a painful indurated mass over the site of the lacrimal fossa, although the anatomic landmarks were obliterated, and the lymph glands much enlarged. Immediate relief was afforded by drainage of the affected area, and when the laboratory reported that serologic study had revealed syphilis, energetic antiluetic therapy was immediately started. Recovery from the eye condition was prompt, and there was no recurrence during the two months we were able to follow up the case.

*Syphilis as an etiologic factor.* The demonstration of syphilis in both these cases prompted me to attempt to determine what percentage of cases of tear-duct inflammation is due to an underlying luetic infection. I found little on ocular syphilis, while the literature on lues of the lacrimal apparatus was very meager indeed. For example, in the pamphlet on "The diagnosis and treatment of ocular syphilis" issued by the New York Tuberculosis and Health Association in 1943, one finds:

*Lacrimal apparatus:* A primary syphilitic lesion of the lacrimal gland rarely occurs. Inflammation of the lacrimal gland (dacryoadenitis) appearing in the tertiary stage of syphilis, is characterized by a painless or slightly tender, localized tumor in the region of the gland. Primary and secondary lesions of the tear-passages seldom occur. Syphilitic lesions of the lacrimal sac and nasolacrimal duct may occur in the tertiary stage of syphilis. They are frequently secondary to syphilitic lesions of the adjacent parts, as, for example, syphilitic inflammation of the medial and lower angle of the orbital margin.

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The oldest work on syphilis of the eye to which I have access—Thomas Hewson's "Observations on the history and treatment of the ophthalmia accompanying secondary forms of lues venerea," published in London in 1824—has nothing whatever to say about luetic infection of the tear ducts, although it makes most interesting reading on the general subject of ocular syphilis. Neither is dacryocystitis mentioned as etiologically dependent on syphilis in any of the standard works on ophthalmology in use during the remainder of the nineteenth century. Indeed, the present century was well advanced before such a possibility was recognized by either general practitioners or ophthalmologists in eye work or syphilology.

The 1934 edition of Stokes' "Modern clinical syphilology" discusses Mikulicz's syndrome, which is defined as "a chronic symmetrical painless enlargement of the salivary or lacrimal glands." We are told that its "etiology is probably a chronic infection, tuberculosis and syphilis having been demonstrated in some cases." A canvass of the literature shows that primary syphilis was occasionally demonstrable in the lacrimal gland, the dacryocystitis being secondary to it. Such a case was reported by Anargynos in 1901. Tuberculosis of the inner canthus was the first diagnosis. Simultaneously with the swelling of the gland, hypertrophy of

the conjunctiva occurred, there was a scattering of small yellowish nodules which later coalesced, and an accompanying adenitis in the preauricular lymph-glands. The lacrimal gland was removed, but pathologic study showed no tuberculosis. Four weeks thereafter the patient's body displayed a papulomacular exanthema, with generalized lymph-gland involvement. All the manifestations promptly subsided under antiluetic treatment, which in 1901 was considered proof positive of syphilitic infection.

The 36-year-old woman seen by Luedde in 1911, gave a history of "an abscess of the corner of the left eye" of 4 or 5 weeks' duration." Examination showed what appeared to be "an ordinary inflammation of the lacrimal sac, except that the bulk of the swelling was higher than usual." But the therapy usually efficacious in dacryocystitis had no effect. Three weeks elapsed and the patient "even seemed to be getting worse." An inquiry into the woman's social antecedents offered a syphilitic infection as a possible explanation. Acting upon this hint, Luedde pushed antiluetic measures, with immediate subsidence of all the ocular manifestations. The author remarks, "It is evident that we were dealing here with a gummatous process springing from a latent lues of long-standing. The location of the trouble, together with the subjective symptoms (overflow of tears, excessive secretion, swelling, and others), and the rarity of luetic processes of this type obscured the diagnosis."

*Is the left eye more commonly effected?*  
Inasmuch as both my own patients suffered from infection of the *left* lacrimal duct, it has been of especial interest to me to note that all the preceding cases were of leftsided dacryocystitis. I can see no reason why the left side should be more often involved and the fact is probably

only coincidental, but it will be of interest to note, as such cases are more often reported, whether or not the condition has a predilection for the left side.

In the case of Parker, reported in 1913, the patient was a boy, aged 6½ years, with a history of having suffered since six months of age with bilateral purulent dacryocystitis. The author tells us,

... We believed the case to be one of congenital obstruction of the ducts. These cases usually depend upon failure of complete absorption of the epithelial cord, which . . . in the embryonic state is developed from an ingrowth from the epithelial surface. Such cases are usually unilateral and are characterized by overflow of tears and acute attacks of dacryocystitis beginning shortly after birth. They are generally completely cured by the passing of probes, rupturing the occluding membranes. This child was treated in this manner, but after prolonged probing, the treatment continuing many weeks, and failures to secure drainage, both lacrymal sacs were removed, with a complete cure of the dacryocystitis.

Syphilis was not, however, suspected until four years later, when the boy returned to the hospital with a severe interstitial keratitis. At the time of this second entrance, the routine examination included a Wassermann test, which gave a strongly positive reaction. Profiting by this experience, Parker had a Wassermann done on another child who just then came in with an acute dacryocystitis, and secured an equally positive reaction. He remarks that he had learned the lesson that "in all cases of bilateral epiphora or dacryocystitis coming on without definite history" a Wassermann test should be made.

The discovery of the Wassermann test facilitated the detection of a luetic origin in all sorts of eye affections, just as it did in almost every other field of medicine. In 1914, Igersheimer published a series of cases wherein hereditary syphilis had affected the lacrimal apparatus. He pointed out that many instances of dacryocystitis wherein the cause had been attributed to

nasal infection, were in reality cases of hereditary syphilis of the upper respiratory tract, either in the submucosa or the underlying bony structures, which had produced stenosis of the lacrimal passages, with resulting dacryocystitis. The fact that many children so affected also have chorioretinitis, or parenchymatous keratitis—both of which are known to be frequently syphilitic in origin—is a strong confirmation of this theory.

Igersheimer gives a more detailed consideration to the luetic origin of many instances of lacrimal-duct inflammation than any who went before him. He divides the cases into three groups:

(1) Those in which the origin cannot be demonstrated, but the present appearances made it reasonable to assume that earlier in life stenosis of the nasal passages had occurred, resulting in lacrimal-duct inflammation.

(2) Those wherein syphilitic changes in the nose could not be demonstrated, but there was a history of syphilitic infection.

(3) Those wherein a "saddle-nose" or other nasal deformity associated with syphilis existed as positive proof of the etiology of the lacrimal-tract involvement.

In 1915, Potter told the members of the Laryngological Section of the Royal Society of Medicine of London of the case of a girl aged 12, concerning whom no history of her previous condition was obtainable, "since the child was sent to me from a work house infirmary." On examination of the child after she reached the hospital, widespread destruction of the septum and left side of the nose was discovered, while the uvula was entirely absent. We cannot, today, share the surprise of both speaker and audience that a bilateral dacryocystitis should have resulted under such circumstances.

The thesis that Guilini presented at Munich in 1914 concerned luetic infection

of the lacrimal gland, and in the same year—that in which the first World War began—Dewabripont published a monograph with the imposing title "Contribution to the study of the bacteriological and histological relationships between disease conditions of the nose and of the lacrimal ducts," containing an elaborate classification of the causes of dacryocystitis, the seventh of which was "Syphilis," which, he stated, was regularly secondary to syphilis of the nasal bones. Dewabripont was a Belgian, and probably familiar with Kalt's article in the volume of the "Encyclopédie française d'Ophthalmologie," which was published in 1909. Kalt states that as far back as the days of Boerhave, syphilis of the nose was recognized as being likely to cause blockage of the lacrimal ducts, and subsequent inflammation, and continues by listing four "observations" culled from French literature, namely those of Alexander, Thiry, Galezowski, and Panas.

... Alexander's patient showed osteo-periostitis, necrosis of the maxillary bone, and a fungoid condition of the lacrimal sac; Thiry's had periostitis of the left tempero-mandibular articulation with a syphiloma in the region of the lacrimal sac, all having appeared eight months after the original luetic infection. In Galezowski's case the syphiloma appeared as a secondary manifestation, terminating as gummatous hyperplasia of the anterior wall of the sac. Panas saw a man, aged 45 years, who was infected with syphilis at age 25, but was otherwise in good health. He now presented a huge fungating mass in the region of the lacrimal sac of the left side, which at first sight suggested a cancer. But as he also had characteristic lesions of the tonsils and nasal bones, the true nature of the "growth" was recognized, and everything cleared up promptly when anti-luetic measures were instituted.

The author remarks that the only dangers in diagnosing these cases lie in confusion with tuberculosis. And 20 years later we find Kemler making a similar statement, only warning us not to confuse syphilis with foci due to other infections than that of the spirochete.

In 1921 Pais reported a case of "syphilitic dacryocystitis," and from that time forward there was increasing recognition of the importance of this protean disease in lacrimal-tract infection. Reports were published by Treacher Collins (1922) in England; Cowper (1922) and Derby and Cheney (1924) in this country; and in France by Rollet and Colrat (1925), Hudelo d'Allaines and Rabut (1926), and Morel and Gest (1929). The case of Vogt, quoted by several authors, turns out upon translation of the original publication to have been attributed not to syphilis but to gonorrhea. However, Fahmy, an Egyptian, writing *in extenso* on the etiology of dacryocystitis, makes but a brief mention of the spirochete as having appeared in any of his microscopic investigations. And Desvignes, as recently as 1938, remarked that he believed it his duty to publish his clinical history of a 36-year-old woman "because of the rarity of these cases and the importance of establishing an exact diagnosis in order to institute an etiologically rational treatment."

The most recent paper to come to my attention, in which mention is made of the etiologic importance of syphilis in dacryocystitis, is that of Garfin published in January, 1942. In sharp contrast to earlier writers, he states that "syphilis not infrequently occurs as a primary disease of the lacrimal sac, or of the skin overlying it. It may also extend from the inner canthus to involve the sac." He adds, "Through obstruction of the lacrimal canal, syphilis may lead to non-syphilitic dacryocystitis," and he concludes by mentioning that among his first 25 operations on lacrimal sacs he found two external fistulae due to acquired syphilis.

An examination of textbooks, recently published or revised, provides no more information on which exact percentages might be based. Tassman in his "Eye

manifestations of internal diseases" (1942) says, "Dacryocystitis . . . may result from cicatricial contraction following ulcerations occurring in syphilis and tuberculosis." The fourth edition of Neame's "Handbook of ophthalmology" (1942, p. 78) merely states, "Inflammation of the lining mucous membrane of the naso-lacrimal ducts is catarrhal, tuberculous or syphilitic . . . occasionally syphilitic periosteitis . . . for tumors of the upper jaw may cause obstruction by external pressure on the nasal duct," resulting in dacryocystitis.

#### SUMMARY

1. Inflammation of the tear ducts is frequently referred to accessory-nasal-sinus disease, and the possibility of other etiologic factors overlooked.

2. Nineteenth-century ophthalmologists considered congenital anomaly of the facial bones or of the lymphoid tissue of the lacrimal region capable of furnishing an environment favorable to dacryocystitis.

3. When treated by antiluetic measures, two cases of acute dacryocystitis seen by the author promptly subsided. This led him to attempt to determine the percentage of cases of tear-duct inflammation that could be traced to syphilis.

4. A review of literature disclosed but a few recorded instances of proved syphilitic dacryocystitis, and, as late as 1938, the "extreme rarity" of the condition is emphasized.

#### CONCLUSIONS

In comparatively few cases of dacryocystitis has syphilis been recognized as the etiologic factor. It is probable that more careful laboratory examinations might reveal many unsuspected cases.

Therefore, it would seem desirable that serum tests become a regular part of the examination in all cases where the causal factor is in doubt.

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# NOTES, CASES, INSTRUMENTS

## THE USE OF SCLERAL RESECTION IN HIGH MYOPIA\*

REPORT OF A CASE

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Loss of vision in cases of high myopia associated with progressive degenerative changes in the retina and choroid is not uncommon. It is usually so slowly progressive that the patient is not aware of any sudden decrease in the vision; and occasional changes in the patient's glasses are sufficient to relieve the individual. On rare occasions, however, the ophthalmologist is faced with the problem of treating a malignant myopia, with degenerative changes, in which the patient is keenly aware of the rapid failure of vision, and changes of the lenses are of no benefit. Such loss of vision may occur over a period of weeks or several months and may incapacitate the patient to the extent that he is desperately in need of help.

Scleral resection in such desperate cases was suggested to one of us (W. E. B.) in 1934 by Lindner; but he stated that he had never attempted such a procedure in the absence of retinal detachment.

A review of the literature reveals only sporadic accounts of operations performed in these cases of high myopia in which other complications indicating surgery were not present. Müller,<sup>1</sup> Elschnig,<sup>2</sup> Lindner,<sup>3</sup> Pischel,<sup>4</sup> Borley,<sup>5</sup> and others, however, have had rather gratifying re-

sults with scleral resection in more or less hopeless cases of retinal detachment in which previous operations had failed and in which myopia was the underlying disease. Arlt, Wolfe, Perinaud, and Galezowski are reported by Hildesheimer<sup>6</sup> to have attempted shortening the eyeball by excision of a band or bands of sclera to relieve high myopia and to improve retinal detachments in myopic eyes. Results were apparently very unsatisfactory, and there were many serious complications which made these procedures useless.

In 1903, Müller<sup>1</sup> described his operation of scleral resection for retinal detachment in high myopia, and Lindner later modified this procedure. In 1911 Holth<sup>7</sup> presented an operation for reducing myopia by trephining the sclera in the preëquatorial region. He reported results of his operation in seven cases of retinal detachment and in two cases of high myopia in which no detachment existed. He claimed a shortening of the anterior-posterior axis of the globe was produced and a reduction in the degree of the myopia; but he gave no report of visual improvement.

In 1926, Müller<sup>8</sup> presented another operation for decreasing myopia by severing the superior oblique muscle. He reported 25 cases, 21 of which were in highly myopic patients. The results in these cases were said to be a negligible motor loss, enophthalmos of about 3 mm., decrease in the degree of myopia by 3 to 6D., retrogression of the retinal and choroidal changes, and improvement of visual acuity.

In 1937 Hildesheimer<sup>6</sup> reported the use of the electric cautery, in the form of a loop, to excise sclera for the reduction of myopia. He recorded two such cases, in each of which there was a unilateral high

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myopia, one complicated by exophthalmos, and the other, by a grayish prominence of the peripheral retina which he called an imminent detachment. Both eyes so operated upon were reported to be improved.

Spaeth,<sup>9</sup> in the latest edition of his textbook on ophthalmic surgery, devotes a page to "Scleral surgery for high myopia," and considers Lindner's recommendations for scleral resection. However, he gives no report of any use of the operation in the absence of retinal detachment.

Thus the problem of treating a severe and progressive myopia with degenerative changes and rapid failure of vision has been only occasionally reported as successful. It was therefore thought that the following report of a case with the technique used and the visual improvement noted might add to our present knowledge of high-grade myopia and the possibilities of a method of successful surgical treatment.

#### CASE REPORT

Miss P. E., a white nurse, aged 56 years, entered Stanford Eye Clinic on November 5, 1940, for examination because of a recent disabling loss of vision of several weeks' duration. Vision of both eyes had always been subnormal due to a high degree of myopia, but she had been able to carry on with her nursing with

changes in her glasses until several weeks before seeking medical advice. She had worn glasses for nearsightedness since the age of five years. At the time of entry she stated that there had been some loss of vision in the left eye for the previous year, but there had been a more rapid blurring and loss of vision in both eyes during the several weeks previous to entry. She had only recently become unable to read a newspaper, whereas shortly before she had had no difficulty.

At examination the following observations were made: Corrected vision was, right eye, 15/200; left eye, the ability to detect hand movements at 2 feet. Glasses worn were—right eye,  $-17.75D.$  sph.  $\approx -1.00D.$  cyl. ax.  $80^\circ$ ; left eye,  $-18.75D.$  sph. No change in lenses improved the vision. The eyeballs were protuberant in appearance. Ophthalmoscopically, there were many vitreous opacities in each eye, and the fundi showed irregular pigment accumulations at the posterior poles and large extensive areas of choroidal atrophy with a definite ectatic appearance in that region. The changes were more marked in the left eye. A very restricted eccentric field of vision in the left eye was present to objects of 30 mm. diameter. The visual field of the right eye showed extensive loss, but with retention of some of the central portion of the field (fig. 1).

Considering the seriousness of the find-

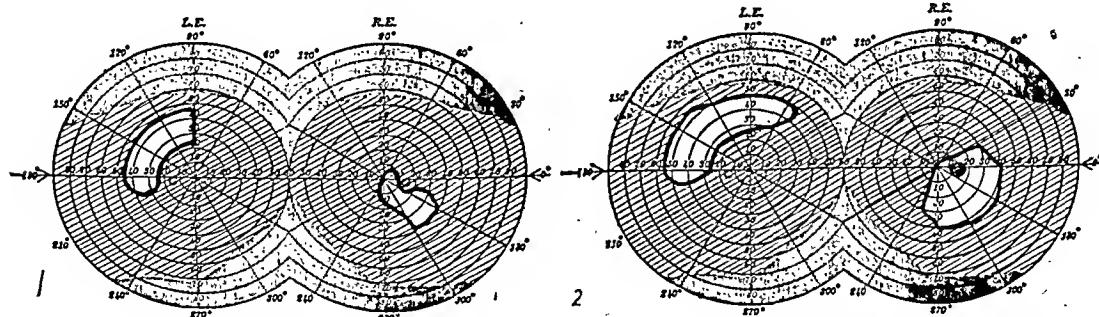


FIG. 1 (Borley and Tanner). Visual fields before operation, January 9, 1941. Test object, 30 mm., white. Field only slightly larger to hand movements.

FIG. 2 (Borley and Tanner). Visual fields three years after operation, September 5, 1944. Test object, 30 mm., white.

ings and the apparent recent rapid loss of visual acuity, it was thought advisable to perform some operation that might prevent further progress of the disease. It was believed that a scleral resection might offer some hope, and operation on the left eye was performed on January 22, 1941. The resection of the sclera was done on the temporal side, 11 mm. posterior to the limbus, from the 12- to the 6-o'clock positions. A strip of sclera 2 mm. wide was removed. The technique was similar to that described in a previous paper by one of us (W. E. B.),<sup>5</sup> with the exception that, in removing the strip of sclera and bringing the sutured edges together, repeated paracenteses were required to allow escape of fluid, with consequent lowering of the intraocular pressure, in order to replace the protruding choroid. It was not considered advisable to puncture the vitreous body to relieve the tension because of the possibility of injuring the retina and causing a retinal detachment.

The postoperative course was uneventful. The field of vision and the visual acuity did not immediately change, but this eye remained essentially the same. Within the next two months there was a progressive loss of vision in the right eye, and it seemed likely that all useful vision might be lost. Scleral resection was proposed for the right eye, and the patient gave her permission. Vision just before operation in this eye was 15/200, with difficulty. There was further limitation of the field of vision.

Scleral resection was done on the right eye on June 18, 1941. A 2-mm. strip was resected as on the other eye, from the 12- to the 6-o'clock positions on the temporal side. The choroid was cauterized with 3-percent sodium hydroxide and the scleral edges approximated with no. 0000 chromic catgut after aqueous had been repeatedly released by means of paracenteses.

The postoperative course was similarly uneventful. The vitreous after several months appeared clearer, and the fundus was more easily seen. The patient stated that her vision had improved and that she could get about definitely better. There seemed to be slight but definite improvement from that time on, and by January, 1943, the condition seemed to have reached a stationary point, with demonstrable improvement in visual acuity and visual fields, particularly in the right eye.

At the time of the last examination on September 5, 1944, the corrected vision was: R.E. 15/70; L.E. ability to count fingers at 2 feet. The glasses worn at the time of entry to the clinic in 1940 could not be improved upon. With a hand magnifying glass, the patient could read Jaeger 8 type print with difficulty with the right eye, and had managed to read part of a newspaper daily for the past year. Visual fields were essentially the same as in January, 1943 (fig. 2). There were no further changes in the fundi, except that in the right eye an area of choroidal scars and pigmentation similar to that seen after operations for retinal detachment could be seen far temporally in the area of the scleral resection.

#### DISCUSSION.

The case just described demonstrates that scleral resections may be successfully used in the absence of retinal detachment. The main point of difficulty arises when the protruding choroid is replaced and the sutures tied. Great care must be used to avoid injury to the choroid with consequent hemorrhage. The simple expedient of anterior-chamber paracenteses repeated at about five-minute intervals during the suturing greatly facilitates the closing of the wound. Cauterization of the choroid with sodium hydroxide is done as in all types of scleral resection. It



is our opinion that cases of this type derive some benefit from this operative procedure, either in improvement or in prevention of further progress of the disease to ultimate total loss of vision from degenerative changes or retinal detachment.

### CONCLUSIONS

Scleral resection in highly myopic eyes

with degenerative changes but without retinal detachment is feasible and possible, without injury to the retina or choroid. With the use of this procedure the progress to blindness from degenerative changes or retinal detachment in these eyes may be delayed or prevented.

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## PENICILLIN ADMINISTERED LOCALLY IN GONORRHEAL OPHTHALMIA

### SENSITIZATION REACTION

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Enthusiastic reports upon the results of penicillin therapy in cases of surgical infection are continuously coming to our attention. Only a limited number, however, record the local use of an aqueous solution of penicillin in the conjunctival sac; nevertheless, they<sup>1,2,3</sup> speak of gratifying results.

Since penicillin has established an important place in the treatment of gonor-

rheal urethritis, it was anticipated that its intramuscular use in gonorrheal conjunctivitis would result in a satisfactory recovery. However, we were anxious to observe the effects of the local application of the drug into the conjunctival sac in a case of gonorrheal ophthalmia. One particular patient was well suited for this method of local treatment because the infection certainly was a fulminating one, although the cornea was intact and showed no immediate danger of sloughing.

In addition to the excellent result which was obtained from the use of this new drug, this case is reported because of the local drug sensitivity which resulted after prolonged use of the solution, and because of the allergic activation of the lids fol-

lowing later intramuscular injections.

The patient, a white man, aged 40 years, was admitted to the Lawson General Hospital on November 2, 1943. He stated that approximately 12 days before admission the right eye had become injected and had gradually become severely inflamed. Ophthalmologic examination revealed vision: R. 20/100, L. 20/15. The lids of the right eye were moderately red, thickened, very firm to the touch, swollen shut, and were so leathery that they were opened with difficulty, and a lid retractor had to be used. Thick, dirty, yellow pus literally flowed from between the lids, so that the cheek required almost constant wiping. The conjunctival sac was filled with thick pus. The palpebral conjunctiva had the appearance of "raw beefsteak." The bulbar conjunctiva was injected and so thick that a ring of depression was produced around the limbus. The cornea was moderately hazy. The pupil was very small and reacted sluggishly to light. A smear made from the secretions was filled with pus cells and gram-negative, intracellular diplococci, morphologically resembling gonococci. The culture was confirmatory. The left eye appeared entirely normal with a minimal amount of conjunctival injection, and during the entire course of the disease remained uninvolved.

The patient admitted having had a recent attack of gonorrheal urethritis which apparently had subsided following sulfonamide therapy. However, a smear made from a mucoid urethral discharge was positive for the gonococcus.

Atropine sulfate, a 1-percent ointment, was instilled once, and four drops of a saline solution of penicillin (500 units per cubic centimeter) were instilled into the right conjunctival sac every hour, beginning at 5:00 p.m. on the same day. At the end of 16 hours, there was marked objective improvement. The vision, even

under atropine, had improved to 20/40, the purulent discharge had ceased, the lids were less thick, and the conjunctiva was less elevated. Although upon admission the smear from the conjunctival secretions presented many gonococci, a similar examination made on this second day of treatment revealed a complete absence of the gonococci. Beginning at 10:00 p.m. on the second day of hospitalization the penicillin was instilled every three hours, and on the third day, beginning at 6:00 p.m. the strength of the penicillin solution was reduced to 250 units per cubic centimeter. One drop of a 1-percent atropine sulfate solution was instilled each morning during the first week of hospitalization, following which it was administered every third day. Three days after admission iced normal saline compresses were applied to the right eye four times daily.

Daily smears and cultures as well as occasional conjunctival scrapings remained negative until the seventh day when gram-negative intracellular diplococci were again seen. As a consequence of this finding, the penicillin solution (250 units per cubic centimeter) was again instilled every hour for 12 hours, and, subsequently, was again administered every three hours.

The lids became almost normal; there was only mild ptosis, and, although the bulbar conjunctiva was much less injected, the palpebral conjunctiva was only slightly improved.

On the twelfth hospital day, while the penicillin was still being administered every three hours, the lids of the right eye suddenly became very thick, dull red, and leathery, and the epithelium of the skin surface became slightly fissured. In addition, there was almost complete ptosis of the upper lid. The bulbar and the palpebral conjunctiva remained unchanged. Examinations of smears made from conjunctival scrapings were negative. The

clinical appearance was that of a typical drug sensitivity, and, in view of the fact that the atropine solution was being instilled only twice weekly, it seemed evident that the penicillin solution must be held responsible for this reaction. This solution was discontinued immediately, but the atropine and the iced saline compresses were continued.

Rapid improvement occurred by the fifteenth hospital day. The vision in the right eye, under atropine, was now 20/25. The epithelium of the lids began to desquamate, and bland sterile oil was applied externally. On the seventeenth hospital day the external appearance of the lids was normal, and all local treatment was discontinued. The bulbar conjunctiva had a normal appearance, and the cornea was clear. However, there remained considerable palpebral conjunctival injection of the lower lid, with marked thickening and redness of the inferior fornix. The upper lid was almost normal in appearance. Repeated smears and a culture of the conjunctival scrapings were negative, and zinc sulphate solution (0.25 percent) was instilled, one drop four times daily. One week later the strength of the solution was increased to 0.5 percent. The conjunctiva of the inferior fornix gradually became less injected, and all local treatment was discontinued.

Although no urethral discharge was perceptible, several cultures of the urine were reported positive for gonococci. Consequently, on the 36th hospital day 50,000 units of penicillin were injected intramuscularly as follows: 10,000 units every three hours for five doses. Following the final injection at 8:00 p.m., the lids of the right eye became moderately edematous, with partial ptosis of the upper lid; and the conjunctiva became moderately injected. There was no secretion nor discharge and the smears and cultures of conjunctival scrapings remained nega-

tive. This reaction resembled a typical allergic manifestation, which completely subsided in a few days, following the use of iced saline compresses and one drop of a 1 to 1,000 solution of adrenalin hydrochloride four times daily.

After this episode the conjunctival scrapings and urinary cultures remained persistently negative, and the visual acuity was: R. 20/20, L. 20/15. Both the palpebral and bulbar conjunctiva appeared normal and the patient was discharged from the hospital and returned to duty.

*Comment.* We were encouraged to use penicillin locally in the conjunctival sac after reading the report of M. E. and H. W. Florey<sup>3</sup> upon their success with one patient who had gonorrheal ophthalmia neonatorum.

From our experience in this case it would seem that hourly local instillations of saline penicillin should be continued for a period of 12 hours, followed by instillations at 3-hour intervals. The penicillin should be continued until three successive daily smears and cultures of conjunctival scrapings have been reported as negative. Subsequent use of this drug would depend upon the presence of the gonococcus in future smears or cultures of conjunctival scrapings.

The procedure we followed was prompted by our desire to test the efficacy of penicillin locally and therefore we delayed giving the intramuscular injections. We believe it is safe to say that in a patient with gonorrheal ophthalmia, in the absence of an associated genital infection, one would be entirely justified in applying penicillin in saline solution directly into the conjunctival sac. However, should an ophthalmic and a genital Neisserian infection occur concomitantly, both intramuscular and local therapy would be indicated.

Our patient responded so rapidly to local penicillin treatment, that, except

for the usual hygienic measures, no special attempt was made to protect the other eye. It must be remembered that the solutions of penicillin which we used, namely 500 and 250 units per cubic centimeter, were relatively very weak, and using only four drops, reduced each dose roughly to 125 and 60 units, respectively.

#### CONCLUSION

1. An exceedingly severe case of gonorrheal ophthalmia responded to local treatment with penicillin, yielding negative smears and cultures, in less than 24

hours of treatment.

2. Prolonged use of penicillin locally resulted in a typical drug-sensitization reaction, such as occurs in individuals sensitive to atropine or the mercurials.

3. Twenty-three days after local use of the penicillin was discontinued, intramuscular injection of the drug was given for the gonorrheal urethritis. This procedure was immediately followed by a typical drug reaction in the lids of the involved eye.

*Eye Section, Lawson General Hospital.*

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#### VOLUNTARY PUPILLARY MOVEMENTS\*

J. ROSENBAUM, M.D.  
*Montreal*

This case is of interest in that the patient was able to contract or dilate the pupils at will, without imagining fear, excitement, or horror during the demonstration. She stated that she first noted that she could control the movements of the pupils while looking into a looking-glass when she was about 10 years of age. In the cases recorded in the literature, the pupils dilated when the subject imagined something horrible or that great danger was imminent.

In 1931, Petrovie and Tschemolossow<sup>1</sup> described the case of an oculist, aged 62 years, who had for years been able to

dilate his pupils voluntarily by imagining something horrible. His health had always been good, but in the last few years he had developed some neurasthenic symptoms. The authors observed and described one such experiment lasting 30 seconds, in which the patient gradually dilated his pupils from a width of 3 mm. to 4.5 mm., with simultaneous increased frequency of the pulse rate from 60 to 72 per minute.

It seems that this phenomenon can be explained on the grounds of the existence of a connection between the cerebral cortex and the pupillary center of the oculomotor nucleus, whereby one can control by the will the movements of the pupil through the action of the sympathetic and parasympathetic fibers in the iris muscles. A similar phenomenon is seen in rare individuals who are able to dislocate the shoulder and hip joints voluntarily by

\* Presented before the Montreal Ophthalmological Society, October, 1943.

merely relaxing the muscles and ligaments surrounding the articulation.

Chauveau<sup>2</sup> (1861), Claude Bernard<sup>3</sup> (1892), and others have shown that stimulation of any sensory nerve results in a dilatation of the pupils. The dilatation does not depend directly on the physical intensity of the stimulus but is a function also of the state of receptivity of the higher centers, for after ablation of the cerebral cortex the reflex is completely lacking. Strong psychical stimuli act in a manner similar to sensory stimuli and under the excitement of extreme interest, emotion, or fear, pupillo-dilatation is very evident (J. Müller,<sup>4</sup> 1840). The pupil thus forms, as described by Duke-Elder,<sup>5</sup> a delicate psychical aesthesiometer; for every stimulation, be it sensory or psychic, which reaches consciousness tends to bring about a dilatation. For this reason pupillary dilatation occurs during the period of excitement in the induction stage of anesthesia, the pupil is contracted in sleep or in narcosis when such impulses are lacking, and on waking from sleep or anesthesia the pupils dilate to their normal size. Pupillo-dilatation occurs on stimulating almost any region of the cortex, whereas a pupillary constriction results if the corresponding half of the cortex is ablated (Trendelenberg and Bumke, 1911). The influence of the cortex, therefore, may become effective either through a stimulation of the sympathetic dilatory mechanism or an inhibition of the autonomic constrictor mechanism.

*Case report.* An unmarried woman, aged 35 years, an Austrian, came to the writer complaining of having found it difficult to read for the past few months. With the right eye vision was 20/30; with the left eye, 20/20. Under mydriasis there were four diopters of hypermetropia. She had orthophoria, as indicated by the objective cover test and the Maddox rod test.

Ocular movements were normal in all directions. The near point of convergence was 6 cm. She could overcome a prism 14<sup>a</sup> base out. Her fundi and fields of vision were normal. Her pupils were, equal, regular, and active, and measured 3 to 4 mm. Her irises were light gray in color. She remembered no illnesses; her general condition was excellent. Her parents were well and healthy.

The patient was seated in a comfortable chair in ordinary daylight illumination; her pupils measured 4 mm. She was asked to dilate her pupils—calmly she looked into the distance and one could see the pupils dilate slowly to about 6 mm.; they remained dilated for about 20 seconds, then she blinked her eyes, and the pupils were seen to return to normal size. She was now asked to contract the pupils—she blinked, looked straight forward, and the pupils contracted to about 2 mm., the contraction lasting for about 20 seconds, after which she blinked and the pupils dilated to 4 mm.

My explanation of the phenomenon is that through training, she had developed control of the cortex, dilating the pupils by inhibiting the pupillo constricting center; conversely, by inhibiting the pupillo dilating center, the pupils would contract.

Another explanation that could be offered is based on the "accommodative process"; namely, when she accommodated for distance, the pupils contracted, and upon relaxing the accommodation the pupils dilated.

*Summary.* A case of a young woman is presented, who, when she looked straight forward was able to dilate and contract her pupils. It is assumed that this reflex speaks for a connection between the cerebral cortex and the pupillary center of the oculomotor nucleus.

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## MOTILITY CLINIC\*

INTERMITTENT (FACULTATIVE) DIVER-  
GENT STRABISMUS. ITS INFLUENCE  
ON VISUAL ACUITY AND THE  
BINOCULAR VISUAL ACT

HERMANN M. BURIAN, M.D.  
*Hanover, New Hampshire*

R. F. P., a white boy, aged 19 years, reported for examination because his eyes were "turning out." His mother had had a similar condition ever since she was a small girl; otherwise there was no history of strabismus in the family. The patient stated that the turning of his eyes had not been noticed until three or four years ago. At that time he was given glasses. He is able to keep his eyes straight, but when he does so "*everything blurs.*"

*Examination.* Both eyes were white and quiet; the media were clear; the fundi presented no pathologic changes.

The eyes appeared in a markedly divergent position when the patient fixated a distant object. He used the right eye for fixation, but was capable of changing fixation from one eye to the other at will and on request. He was also able to overcome the divergence of the visual lines by a convergence impulse, but even when he thought that he was keeping his eyes straight there still seemed to be a large angle of divergent strabismus. In the cover test, the angle of squint for dis-

tance measured 12 arc degrees, with a varying amount of right hypertropia. The discrepancy between this relatively small angle of squint and the appearance of the eyes, which indicated a much larger amount of divergent strabismus, was explained by measuring the angle gamma on the perimeter; this angle proved to be -12 arc degrees in the right and -8 arc degrees in the left eye. For near, the angle of squint measured 25 arc degrees, again with varying right hypertropia. When a red filter was placed in front of the right eye in the double-image test, the patient reported 12 arc degrees of crossed diplopia with 12 arc degrees of right hypertropia. When the red glass was placed in front of the left eye the localization of the second image was quite uncertain, but an uncrossed diplopia of 4 arc degrees with 1 to 2 arc degrees of left hypertropia was reported. The horizontal and vertical afterimages of a straight glowing filament, imaged in the right and left eye, respectively (afterimage test), were seen alternately in the dark; in the lighted room (negative afterimages), they formed a cross (normal retinal correspondence). On the synoptophore the objective and subjective angles were 24 B.I. with 7 R.H.; there was only momentary fusion, which could not be held. The rotations presented a definite deficiency of the adduction in both eyes, particularly in the left; otherwise they were normal. The convergence movements were jerky, but the near point of convergence was very good (6 to 8 cm.), and convergence was held well.

\*From the Clinical Division of the Dartmouth Eye Institute, Dartmouth Medical School. The case described was demonstrated at a staff meeting of the Dartmouth Eye Institute.

*Refraction and visual acuity.* R.E.  $-0.50\text{D. sph.} \approx -0.50\text{D. cyl. ax. } 90^\circ = 20/20$ ; L.E.  $-0.25\text{D. sph.} \approx -0.25\text{D. cyl. ax. } 90^\circ = 20/20$ . The patient continued to have a visual acuity of 20/20 in either eye, as long as he let the other eye turn out. As soon as he straightened his eyes by a convergence impulse, the binocular visual acuity sank to barely 20/200. If lenses of  $-2.00\text{D. sph.}$  were now placed in front of the eyes the binocular visual acuity increased immediately to 20/20.

*Therapy.* An advancement with resection of the left internal rectus muscle was performed. Six weeks after the operation there was a residue of divergent strabismus of 6 to 7 arc degrees. The double-image test showed 3 arc degrees of crossed diplopia with 3 arc degrees of dissociated vertical divergence; the corrected visual acuity was 20/20 monocularly in each eye and 20/30 binocularly. The patient was advised to return for recheck and further surgery (advancement with resection of right internal rectus), but could not do so since he entered the service.

#### COMMENT

Cases such as the one reported are usually diagnosed as intermittent or periodical divergent strabismus. They differ, however, somewhat from the ordinary untreated type of intermittent convergent or divergent strabismus in that the patients are able to keep their eyes straight by a voluntary act of convergence. I prefer, therefore, to classify these cases under the heading of *facultative divergent strabismus*.

The near-point of convergence is always excellent in these patients, although the adduction may be quite deficient in each eye.\* They are able to overcome the

strabismus by a convergence impulse, but not all of them have learned to dissociate convergence from accommodation. These patients—such as the one under discussion—then complain that their vision becomes blurred when they keep their eyes straight. It is easily shown by placing minus lenses in front of the patients' eyes that this blurring is due to an accommodative effort accompanying the convergence effort.

There are some other interesting features presented by the patient. He has a dissociated vertical divergence which is very frequent in patients with alternating divergent strabismus. Furthermore, he shows both normal and anomalous retinal correspondence in the double-image test, depending on whether he fixates with the right or left eye. When the red glass is placed in front of the right eye—that is, when the patient sees the white fixation light with the left eye—he reports a crossed diplopia of 12 arc degrees, which is in agreement with the objective angle of squint. But when the red glass is in front of the left eye and the patient uses his right eye to fixate the white light on the tangent screen, the localization of the red image becomes uncertain and the patient reports an uncrossed diplopia of 4 arc degrees (anomalous correspondence).

Such a change in the sensorial retinal relationship with change in fixation is found not only in cases of facultative divergent strabismus. It may be explained in the following way: Anomalous retinal

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movement, adduction the result of a conjugate movement (dextroversion or levoversion). These two types of movement are controlled by different centers and may be independently affected. Thus, we see frequently an excess of adduction in convergent strabismus combined with insufficient convergence; or we may have a divergent strabismus with deficient adduction but normal convergence. The choice of operation for strabismus should be based on the behavior of the rotations which can alone be influenced directly by surgery.

\* Convergence and adduction should be strictly separated. Convergence is a disjunctive

correspondence is a condition that is acquired on the basis of usage. When the patient fixates with the habitually fixating eye (in this case with the right eye), he uses his eyes in a way that is normal for him and he localizes the second image according to the acquired anomalous retinal relationship. But when he is suddenly forced to fixate with the habitually deviating eye (in this case the left eye), he is faced with unusual conditions. He then reverts to the more or less dormant innate normal correspondence.

In general, patients with facultative divergent strabismus offer an opportunity for many interesting observations with regard to the visual act in strabismus.\* In addition to the relationship between convergence and accommodation, which the patients may or may not have learned how to dissociate, there is a whole gamut of possibilities as regards the visual act. When these patients keep their eyes straight they may have normal binocular vision or an imperfect or even only rudimentary binocular coöperation. When their eyes are dissociated they show, as a rule, anomalous correspondence. It depends on the percentage of time during which these patients have a manifest strabismus, how deeply the anomalous

retinal relationship is rooted. Since most of them keep their eyes straight a good deal of the time, the anomalous correspondence is usually only superficially established. As a consequence, various phenomena pointing to the instability of the anomalous retinal relationship are frequently observed, such as a change in the retinal relationship with change in fixation.

With respect to the therapy I feel that these patients should always be operated upon, since they frequently have considerable eye fatigue, headaches, and difficulties in close work. Orthoptic exercises prior to the operation are unnecessary. The patients have excellent control over the position of their eyes and anomalous correspondence is usually only superficially established. Nor is it necessary to teach them how to dissociate convergence from accommodation, since they will not have to exert an undue convergence effort after successful surgery. Operation in these cases produces most gratifying and often spectacular results. The patients are relieved of their subjective symptoms; they are unable to dissociate their eyes any longer and, as a rule, soon acquire normal binocular vision. If necessary, this process can be hastened by postoperative orthoptic exercises. The operation of choice in uncomplicated cases is invariably some type of shortening operation of the internal rectus muscles.

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\*Tschermak, to whom we owe much of our knowledge about anomalous retinal correspondence, has himself a facultative divergent strabismus and has reported his self-observations in a classical paper.<sup>1</sup> A case of facultative divergent strabismus, showing some similarities with the one presented here, was discussed earlier.<sup>2</sup>

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# SOCIETY PROCEEDINGS

EDITED BY DONALD J. LYLE

## COLORADO OPHTHALMOLOGICAL SOCIETY

December 18, 1943

DR. C. A. RINGLE, *president*

### QUESTIONABLE RETROBULBAR NEURITIS

DR. W. H. CRISP reported that Mrs. B. S. T., aged 27 years, complained on December 5, 1943, of failing vision in her left eye to such an extent that only the upper half of objects was visible. She was seen again on December 8th, at which time the left eye was tender to palpation. There was also some soreness on movement of the eyeball. She had had a cold which affected the left side of the nose particularly. The vision of the left eye was reduced to ability to see light. The pupil reacted very slightly on direct illumination, although indirect reaction was good.

Examination of the nasal cavity, sinuses, and throat was entirely negative. Neurologic examination showed no signs of systemic disturbance except for some slowness and fatigability of the abdominal reflexes, which sometimes is a very early sign of multiple sclerosis.

The patient was given 30,000,000 typhoid-paratyphoid by intravenous injection on December 9th, and 40,000,000 on December 14th. Good febrile reaction was obtained each time.

The pupil had become somewhat more active. The vision of the left eye improved slightly although limited to the upper half of the field. The left eyeball was no longer sore on pressure.

*Discussion.* Dr. Leo Davis said he thought that this patient had a possible retrobulbar neuritis, probably a result of the cold infection.

### QUESTIONABLE DETACHMENT OF THE RETINA

DR. C. E. SIDWELL said that C. L. M.,

aged 35 years, sustained a penetrating injury to the left eye while using a hammer and chisel. There was considerable hemorrhage into the anterior chamber. Some vitreous escaped through the wound, which was on the nasal side behind the ciliary body.

The foreign body was localized and removed through the wound. The vision was 20/60 after removal of the foreign body but continued to fail until the patient was able to see only light. The iris was bound down by dense adhesions.

### COMPLETE ATTENUATION OF RETINAL VEINS WITH MARKED NARROWING OF ARTERIES

DR. JAMES M. SHIELDS reported that Mr. F. H., aged 44 years, suffered a blow to the right side of his head in October, 1943, when a tractor he was operating in Honduras was involved in an accident. He also sustained injury to the side of the abdomen, and both legs were badly lacerated. He disregarded the injuries at the time but about five days later he appeared at the Infirmary and complained that the right eye was red and painful. The eye was examined and the conjunctival sac was irrigated.

The following day the patient complained of a cutting sensation in the right eye. Treatment consisted of the use of castor oil in this eye. Within a few days the vision of the right eye began to fail. He was told that this resulted from the use of castor oil. The patient was transferred to a hospital in Los Angeles and a diagnosis of iridocyclitis, right eye, was made. A careful search for a possible focus of infection was made, and tonsillectomy was advised. The Wassermann test was negative. Treatment consisted of salicylates and atropine instillations.

When the patient was seen again there

was no conjunctival nor pericorneal injection. The pupil was round and fully dilated. The eyeground showed no veins, only what were thought to be venous walls, which showed as white streaks. The arteries were small and showed no light streaks. The visual field was reduced to a small area on the temporal side; there was no central vision. Visual-field examination was made by use of the Finnoff transilluminator.

Two months had elapsed since the onset of the condition. There probably had been absorption of the hemorrhage usually seen in venous thrombosis. The cherry-red spot, seen in the macula in arterial obstruction, had evidently disappeared. The onset of blindness was gradual, as is frequently observed in venous obstruction.

#### OCULAR INJURY

DR. C. O. EIGLER reported the case of R. W., aged 14 years. On May 22, 1943, while at play, he was accidentally struck in the right eye by a BB shot. The shot struck the cornea below the center but did not penetrate the eye. There were hemorrhage into the anterior chamber, partial dislocation of the lens upward, and an iridodialysis below.

The eye remained quiet and there was no pain. The vision R.E. was 5/60. Treatment consisted of atropine instillations and hot compresses.

*Discussion.* Dr. John C. Long said he thought that the iridodialysis should first be repaired and then the lens removed or needled.

#### ACCIDENTAL GUNSHOT WOUND

DR. W. A. OHMART reported the case of S.K., aged 14 years, who suffered multiple gun-shot wounds to the arm, shoulder, and right eye in a hunting accident, on November 23, 1943. One shot penetrated the right eye at about the 1-o'clock

position, just outside the region of the ciliary body.

A conjunctival flap was made, closing the wound. The usual postoperative treatment of atropine, cold compresses, tetanus antitoxin injection, and later foreign-protein therapy, was instituted. It was very difficult to see the fundus, however, because of vitreous hemorrhage. The lens appeared clear.

X-ray report revealed that there were seven particles of shot in the region of the right side of the face anteriorly. Only three of these were possibly capable of having damaged the right eyeball. Two of them were apparently within the right orbit just beneath its roof. None of these was so situated as to be within the eyeball. It was not believed that any one of them had entered the cranial cavity.

The problem encountered was what type of future treatment would be most beneficial.

*Discussion.* Dr. W. H. Crisp said he thought it advisable to use conservative treatment in an attempt to save the eye.

#### GLAUCOMA

DR. DONALD H. O'ROURKE presented the case of Mr. J. F. Y., aged 42 years. The left eye had been enucleated 2½ years ago. A brief history of the left eye follows:

In June, 1940, the patient had had an acute attack of glaucoma. He was admitted to the eye service of one of the mid-western hospitals. Permanent operation on the left eye was deferred because it was recognized that there were extensive chorioretinal changes in the right eye. Consequently 12 paracenteses of the anterior chamber were performed during a period of three months. Finally a fistulizing operation (the type could not be determined) was attempted, which resulted in failure, and ultimately enucleation was necessary.

In addition to the chorioretinal changes in the right eye, some of which involved the macular area, the patient had a chronic simple glaucoma. The tension was 41 mm. Hg (Schiotz). The vision was 20/50 with +1.00D. cyl. ax. 180°.

This patient was presented to illustrate two points: First, that undoubtedly the procrastination in operating on the left eye, resorting to numerous paracenteses instead, was an unsound surgical approach to the problem.

Second, this case presented the necessity of determining whether the progressive loss of vision in the right eye was due to the chorioretinal changes with some minute hemorrhages in the macula, or to the elevation in tension, or both.

Careful central-field studies, frequent recording of the intraocular pressure, and hospitalization for careful physical check-up were instituted.

While the patient's general medical possibilities were being studied the tension in the right eye responded to 1-percent pilocarpine used four times a day. The tension taken on several occasions was from 17 to 20 mm. Hg (Schiotz).

These findings may delay, but only temporarily, operation on the eye.

Walter A. Ohmart,  
Secretary.

## MEMPHIS SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

December 14, 1943

DR. J. W. MCKINNEY, *presiding*

### SARCOMA OF IRIS

DR. E. C. ELLETT reported two cases of sarcoma of the iris:

The first patient was D. H., a man, aged 56 years, who was seen in consultation in April, 1943. He had had several

attacks of pain and inflammation in the left eye for the past two weeks. The right eye was normal. Vision in the left eye was normal. The lower part of the iris from the 5- to the 7-o'clock position was thick and gelatinous looking. Vessels were seen in the growth and on the surface. The iris was involved from the pupil as far back as could be seen. The tension was normal. The eye was otherwise normal. Enucleation was performed. The growth was a malignant melanoma, spindle cell, subtype B.

The second patient, Mr. H., aged 53 years, was seen in consultation in July, 1943. He said that for 15 years he had had occasional hemorrhages in the front of the right eye which blurred his vision. The vision was normal. For three years he had noticed a yellow spot in the iris. There was a gelatinous mass involving the nasal half of the iris from the root to within 1 mm. of the edge of the pupil. This mass extended from the 2- to the 5-o'clock position. The tension was normal. The eye was otherwise normal. Enucleation was advised, but the patient did not return nor has it been possible to trace him. He had had the same diagnosis and advice a month before this examination.

### A CASE OF SYMPATHETIC OPHTHALMIA WITH RECOVERY OF BOTH EYES

DR. E. C. ELLETT presented C. S., a boy aged 10 years, who was seen on March 27, 1928, and stated that on December 1, 1927, he had been struck in the left eye by a nail. The eye was penetrated but no foreign body remained in it. He received treatment and seemed to be recovering, but about two weeks before he was seen the vision began to blur in the right eye. The eye was painful but not sensitive to light. Both eyes showed some ciliary injection, no photophobia, and the tension of the left eye was questionably elevated to palpation.

*R.E.* The pupil was adherent all around, 4 mm. in size, and inactive. There was a thin film of deposit on the anterior capsule. A good reflex was obtained, but no details of the fundus could be seen. The vision was 20/70, somewhat improved by +2.50D. sph.

*L.E.* There was a corneal scar parallel to the limbus below, from the 5- to the 7-o'clock position. The pupil was oval and adherent. The iris showed several dark areas which protruded. These were atrophic spots, pushed forward by confined aqueous. X-ray examination was negative for foreign body. The condition appeared to be sympathetic ophthalmia.

Autohemotherapy was given, 7 c.c. of the serum injected. Atropine was instilled, and the patient put to bed. The eyes cleared, and on April 2d the vision was *R.E.* 20/20, *L.E.* 20/50, with correction. The fundus of the right eye was visible. The tension was *R.E.* 6 mm., *L.E.* 16 mm. Hg (Schiotz).

On April 11th the vision of the right eye was reduced to the ability to see hand movements. The eye was red and painful. Iris bombé was present. The left eye was unchanged. Diphtheria antitoxin was given daily for a week in doses of 10,000 units. On April 18th, the vision of the right eye was 20/200. The condition did not change during the summer. In October the right eye showed slight ciliary injection; the pupil was small and filled with exudate; and the iris was pushed forward in several spots. The left eye had not changed. In July, 1929, the vision was: *R.E.* 20/50 and J12; *L.E.* 20/30 and J1 with glasses. The eyes were white. Local treatment, which had been continued, was stopped.

In September, 1943, when the patient was seen for the last time, the vision was: *R.E.* 6/18 and J12 with glasses; *L.E.* 6/9 and J1 with glasses. The right eye was white. The tension was normal. There

was one anterior synechia in, and a smaller one down and out. The pupil was active. There were many pale K.P. below. In the left eye there was an adherent leucoma below. The pupil was a vertical slit, but active. There was some deposit on the lens capsule.

This boy was seen by several consultants and opinions had differed as to whether the left eye should be removed. Some advised it, but it seemed to offer his best chance for vision, and was retained with the present happy result.

#### GLAUCOMA WITH UNUSUAL VISUAL FIELDS

DR. PHILIP M. LEWIS presented B. C., a colored man aged 74 years, who had first been seen a few days previously because his vision had been failing for a period of three years. It had recently become very difficult for him to get about without stumbling over things. The vision was reduced to 10/200 in each eye with glasses. The eyes were free from congestion, and the pupils reacted sluggishly. There were early central opacities of both lenses. The tension was 45 mm. Hg (Schiotz) in each eye, but the discs were not cupped. They were rather pale, and the retinal vessels showed considerable sclerosis. No hemorrhages nor other abnormalities were found in the fundi. The visual fields were reduced almost to the point of fixation, the left slightly narrower than the right. The general physical condition was satisfactory, blood pressure was 180/100, the blood Wassermann test normal, and X-ray pictures of the skull and sella turcica normal. The intraocular pressure had remained high in spite of treatment with pilocarpine, eserine, and prostigmine.

*Comment.* While glaucoma may cause marked concentric contraction or "gun-barrel" visual fields, they are rather unusual. If they were due to increased intra-

ocular pressure, the discs would certainly show some cupping. It was thought that in this case the poor vision and contracted fields were due to neither the glaucoma nor the incipient cataracts, but to changes in the occipital lobes that were probably vascular in origin. It was felt that operation to reduce the intraocular pressure was necessary but, because of the contraction of the fields, was extremely hazardous.

#### PROGRESSIVE EXOPHTHALMOS OF UNKNOWN ETIOLOGY

DR. PHILIP M. LEWIS presented Mrs. L. N. R., who was first seen in July, 1943, with what was considered an allergic edema of the eyelids. There was no suggestion of exophthalmos. She was advised to omit all cosmetics temporarily, avoid smoke and dust as much as possible, and to watch her diet carefully. When seen again in September there was a definite protrusion of both eyes, the right measuring 19 mm. and the left 20 mm. The orbital tissues were tense and the globes could not be pushed back into the orbits. The lids were edematous and the retinal veins engorged, but there was no papilledema. Two basal metabolic tests had been made and were normal. Her physician reported that her general physical and laboratory examinations were normal. On the suggestion of Dr. Eustis Semmes, who also saw the patient, she had been sleeping with the head of her bed elevated and taking iodides internally. The exophthalmos had increased about 2 mm., but the lids still covered the corneas adequately. X-ray therapy of the orbits and the Naffziger operation have been considered.

#### REMOVAL OF INTRAOCULAR FOREIGN BODY FOLLOWED BY HEMORRHAGE

DR. PHILIP M. LEWIS reported the case of B. E. M., a white man aged 29 years,

who was struck in the left eye with a piece of steel on August 24, 1943. When first seen, two days after injury, the eye was only slightly inflamed and the vision was 20/30. There was a wound through the lower lid near the lower punctum. There was also a vertical wound through the conjunctiva and sclera in the 7-o'clock position, 8 mm. back of the limbus. The anterior segment of the eye was normal. There was a little blood in the vitreous and a large foreign body could be seen in the upper temporal quadrant, near the equator in the 2-o'clock position. X-ray pictures confirmed this location.

The steel was removed easily on the first application of the magnet to a meridional incision through the sclera at the equator in the 2-o'clock position. Surface diathermy was applied to the sclera of that area before closing Tenon's capsule and the conjunctiva. The following day the vitreous was rather hazy, but the fundus could be seen faintly. But the next day the vitreous was so filled with blood that no fundus reflex could be obtained. For three weeks the eye has remained in the same condition. The steel particle measured 3.5 by 2 by 1 mm.

This case was reported to provoke a discussion as to why this hemorrhage occurred, how it could have been avoided, what treatment if any was now indicated, and what was the prognosis. Should the steel have been removed by the anterior route or was the technique used faulty?

#### EPISCLERITIS AND SCLERITIS

DR. ROLAND H. MYERS presented R. B., a white man aged 55 years, who was first seen in the John Gaston Out-Patient Department on October 24, 1942, with a history of failing vision for the past few months. The vision at that time was: R.E. 5/200, L.E. 20/200. A diagnosis of immature cataracts with myopia was made. On October 6, 1942, an extra-

capsular extraction of the right lens was performed. In April, 1943, a peripheral iridectomy and an intracapsular extraction were done on the left eye. On May 10, 1943, the patient entered John Gaston Hospital with chills and fever. Blood smear was positive for tertian malaria. When discharged from the Hospital on May 12, 1943, he had some conjunctival injection in each eye, with discomfort. He was seen the following day, complaining of severe pain in the left eye. Examination of the left eye revealed a tender globe, and the lateral side from the 1- to the 5-o'clock position was a cherry color. The pathologic process was considered to be an episcleritis, and the patient was placed on dionin 5-percent thrice daily, hot applications, and aspirin compound for pain. After three weeks there was no improvement; then salicylates in heavy doses were given, and X-ray therapy of 150 units. The eye continued to be very painful, and the process increased to involve the eyeball from the 1- to the 7-o'clock position. The patient was sent to the Hospital.

General physical and laboratory tests were essentially negative, the Kahn test negative, X-ray studies of gums negative, prostate gland normal, tuberculin test weakly positive. The following treatment was given: hot, moist applications for 30 minutes, thrice daily, followed by atropine ointment 1-percent, and 3 injections of 10 c.c. of sterile milk at 4-day intervals. Very little reaction was obtained from foreign protein. During the Hospital stay, dionin, thyroid, and heavy doses of salicylates were tried, but no results were obtained. Opiates were often needed for the relief of pain. During his stay in the Hospital, a dark discoloration appeared under the conjunctiva at the 3-o'clock position, and gradually enlarged until it reached to 12 o'clock.

On September 1st, O.T. tuberculin was

started. The initial dose was tuberculin O.T. 0.25 mg. of dilution No. 2. The entire conjunctiva and sclera were red, and the eye painful. A necrotizing process appeared to be in progress in the upper temporal quadrant. Because of the very weakly positive tuberculin test, large therapeutic doses were given. Increasing doses were given subcutaneously every five days until a dose of 10 mg. was reached. Response to the tuberculin was immediate and by the time the No. 3 dilution was finished the pain had subsided, and the eye was clearing. When last seen the eye was comfortable and practically free from congestion. Where the inflammation had been most severe the sclera was now thin and atrophic, so that the characteristic blue color from the underlying uveal tract was quite noticeable. He was still receiving 10 mg. of tuberculin every two weeks.

## MEMPHIS SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

January 11, 1944

DR. ROLAND H. MYERS, *presiding*

### BLOOD STAINING OF THE CORNEA

DR. RALPH O. RYCHENER presented D. S., a boy aged nine years, the cornea of whose left eye was blood stained. On November 14, 1941, the boy had been struck in the left eye with a missile thrown by another youngster, and was treated elsewhere for three weeks with atropine and bed rest. On December 7th, there was blood staining of the cornea of the greenish-gray type with a clear zone at the limbus, giving slightly the appearance of a lens dislocated into the anterior chamber. The tension was elevated, and eserine was prescribed. There was gradual improvement in the resorption of the corneal stain, and two years later there was only a high

central fibrotic area of corneal scarring. However, there was almost complete absorption of the iris, and the ocular tension varied between 35 and 48 mm. Hg (Schiotz). The vision was reduced to ability to see light. A partial traumatic cataract was present.

It was deemed advisable to lower the pressure surgically in order to retain a good-looking eyeball, and, because of the traumatic aniridia, cyclodialysis was considered the operation of choice. This was performed on November 26, 1943, but was followed by hemorrhage into the anterior chamber, increased intraocular pressure, and secondary blood staining of the cornea. Paracentesis allowed evacuation of some heavy black clot and relieved the oculocardiac symptoms. The prognosis remained undetermined.

#### INTRACORNEAL HEMORRHAGE

DR. RALPH O. RYCHENER reported a case and exhibited a kodachrome slide of hemorrhage into the cornea, complicating a violent interstitial keratitis of luetic origin.

Mrs. A. E. W., aged 44 years, under treatment for syphilis, was seen on March 31, 1941, with an early interstitial keratitis of the right eye. A vascular fringe invaded the cornea from above, the epithelium was edematous, and a dirty-gray, plastic membrane was adherent in many places to the endothelium. The pupil was miotic but dilated to cocaine and atropine. Following the instillation of a single drop of dionin, there was a marked conjunctival reaction associated with hemorrhage from the vessels invading the cornea, causing an area of intracorneal hemorrhage measuring 2 by 4 mm. along the limbus above. This was well absorbed in 24 hours and entirely gone after 48 hours. Blood staining of the cornea is due to an absorption of blood-pigment products from an adjacent

subconjunctival or anterior-chamber hemorrhage. True hemorrhage into the cornea can come only from invading blood vessels.

#### HEMORRHAGE INTO THE LENS

DR. RALPH O. RYCHENER reported a case and exhibited a kodachrome slide of hemorrhage into, or blood staining of, the lens. Mr. S. H., a colored man aged 58 years, had been struck in the left eye while cutting wood. When he was seen one week later, the eyeball was red, the anterior chamber deep, a few posterior synechiae were visible, and there was massive hemorrhage into the vitreous. Atropine and aspirin were prescribed.

Seven months later the vision was reduced to perception of moving objects, and the pupil dilated roundly. Mature traumatic cataract with an inferior quadrant of subcapsular violaceous blood staining or hemorrhage into the lens was present. Apparently a rupture of the lens capsule on the inferior or posterior surface had occurred by contrecoup. The patient was not seen again.

#### SPONTANEOUS HOLE IN THE RETINA WITHOUT DETACHMENT

DR. RALPH O. RYCHENER said that Mrs. C. C. C., aged 58 years, had been observed for three years following a spontaneous hole in the retina without subsequent separation. For a month prior to December 16, 1940, she had been conscious of floating spots before the left eye. On that date her vision with correction was 6/6. Vitreous hemorrhage was present which apparently originated from a retinal hemorrhage far out and up at the third branching of the superior temporal vein, where a fresh hemorrhage overlay a venule. Two weeks later the hemorrhage had cleared, but a crescentic tear with a trapdoor tongue was visible in the retina at the original site of the hemorrhage.

The extent of the area involved was approximately one-half disc diameter. Eight days later the tongue had become detached and was visible in the mid-vitreous as a small, round operculum. Serous, subretinal elevation surrounded the hole, and the entire area then involved was the size of the disc. The eye was closely watched, but never thereafter was there any further evidence of separation.

Three months later the serous elevation seemed less marked and the edges of the retinal hole seemed flatter. After a year the retina was entirely reattached about the hole and since then it has been possible to view it only with some difficulty, since there now was scarcely any contrast between retina and exposed choroid. The visual acuity and fields were still normal.

#### LASHES IN ANTERIOR CHAMBER

DR. RALPH O. RYCHENER reported that R. C., a boy aged 6 years, had been accidentally struck in the left eye with a scissors point. He was seen 30 hours later, and there was a T-shaped laceration of the cornea just inside the limbus at the 3-o'clock position, with iris prolapse. The iris inside the chamber as well as out was covered by a dirty-gray membrane. The prolapse was excised, and an effort made to remove the plastic exudate covering the pupil. This was successfully done, although it was tenacious and of the consistency of old cyclitic membrane, and proved to include four eyelashes. The cornea was closed with intracorneal sutures, and sulfadiazine and foreign protein were administered.

Due to the resistance of the patient to any medication or examination, it was necessary to remove the sutures under general anesthesia. One month later the iris was drawn toward the wound with partial iris bombé. The eye was white but soft. The vision was reduced to light perception.

#### CORNEAL TRANSPLANTATION

DR. J. WESLEY MCKINNEY presented the case of R. S., aged 19 years, who was injured in 1926, in a furnace explosion. Both eyes were severely damaged; the left eye was removed four months later. The right eye recovered and retained good vision for a year and a half. The patient was then hit in the right eye and has since been blind.

When first seen in 1938, the vision was ability to see light. Then tension was 40 mm. Hg. (Schiotz). The cornea was slightly edematous and showed a zonular opacity with calcium deposits which occupied the lower two thirds. The rest of the cornea was relatively clear. The anterior chamber was deep; the pupil was active and central; and the iris was tremulous. A red reflex could be seen in the pupil by directing the ophthalmoscopic light through the upper periphery of the cornea. No lens could be seen.

It was planned first to reduce the tension to normal and, if this were accomplished, to perform a keratoplasty to be followed, if necessary, by extraction of the dislocated lens. Consequently, a cyclodialysis was performed above, with some bleeding into the anterior chamber which cleared up rapidly. The tension remained normal for six weeks, when the eye became red and painful.

At examination, a shrunken cataractous lens was found in the anterior chamber; the cornea was edematous; and the tension 2+. In order to keep the lens in the anterior chamber until extraction could be performed, eserine was instilled repeatedly without appreciable contraction of the pupil. Aminglaukosan was then instilled, with marked constriction of the pupil behind the lens. A short Graefe knife incision was made above and enlarged with scissors, and the lens delivered with the aid of a broad spatula. The tension remained slightly elevated



for several months, necessitating a second cyclodialysis, which was performed down and temporally. This controlled the tension. Four months later a corneal transplantation was performed, with tissue from an eye enucleated for sarcoma of the choroid. The graft remained quite clear except during several bouts of increased tension which would cause edema of the graft. The fundus could be seen fairly well and showed widespread atrophy and pigment migration. The final vision was 3/200 for distance and 20/400 on the Lebensohn chart for near with the print held close.

The visual results obtained in this case could in no sense be called good, but this boy who had had only light perception in his remaining eye was now able to get about alone and to read large headlines in the paper.

#### MALIGNANT HYPERTENSION

DR. E. C. ELLETT reported that H. E. M., aged 65 years, who was seen on June 21, 1943, gave a history of failing vision in the left eye since May 3d, and in the right eye since May 4th. Examination showed a slight lens opacity in each eye and sclerosis of the retinal vessels. In the right eye the nerve was swollen two diopters. There were retinal hemorrhages and exudates and a tendency to a star figure at the macula.

#### THROMBOSIS OF THE CENTRAL RETINAL VEIN WITH SECONDARY GLAUCOMA AND RECOVERY

DR. E. C. ELLETT said that Miss H., aged 50 years, who was seen for the first time in May, 1932, had high blood pressure and had had a retinal hemorrhage two months before she was seen. The vision in the right eye was 5/60, left eye 6/6. The right eye showed an obstruction of the central retinal vein, and the tension was 50 mm. Hg (Schiotz). The

fundus was covered with large, dark, flame-shaped hemorrhages, radiating from the disc. The patient received general treatment from her physician, and pilocarpine drops were prescribed for the right eye. The tension declined, and in October it was 18 mm. In November the patient had a vitreous hemorrhage which obscured the fundus but did not disturb the tension. The vitreous cleared in about two months. This patient was seen at intervals, and in August, 1943, the vision in the right eye was about the same as it had been 10 years before. The tension was 16 mm. Hg (Schiotz). The blood pressure was 220/130. The fundus was dimly seen because of the lens opacity. There seemed to be no retinal hemorrhages, but there were many white patches. The left eye showed copper-wire arteries and arteriovenous compression, but the vision remained normal.

Dr. Ellett said that in his experience this was the only case of secondary glaucoma following obstruction of the central retinal vein in which recovery had taken place.

#### OBSTRUCTION OF A RETINAL ARTERIAL BRANCH

DR. E. C. ELLETT reported two cases as follows: Miss B., a nurse aged 37 years, was refracted in 1940 and again in 1942, and the vision in each eye was normal. In August, 1943, she gave for the first time a history of occasional blurring of vision of the right eye, which always cleared, but a few days before this visit it had blurred and remained blurred. The left eye was always normal. The vision was R.E. 3/200, off center. The media were clear but there was an area of retinal edema above the disc, and the superior branch of the artery seemed smaller than the inferior. A paracentesis of the anterior chamber was performed, and amyl nitrite given by inhalation. The

vision improved rapidly and was normal in three days. At that time, the edematous area was of better color and all the vessels were visible except the ascending nasal artery, which was concealed by the edema and appeared farther out, considerably constricted. The nerve was sharply outlined below, but blurred above. There was one linear hemorrhage at the lower edge of the edematous area. The patient had another short blurring spell two weeks later. Her general examination was negative except for a bad tooth, which was removed. Late in September, the vision was 6/6 and J1. The upper half of the nerve was pale, and the superior vessels were smaller than the inferior. The visual field of the right eye showed loss of the lower half from just below the fixation point.

Mrs. W., aged 42 years, a trained nurse and wife of a physician, was seen in August, 1942, complaining that she had been seeing fireworks in the medial side of her right eye for a month. She had had several blind spells in the right eye, especially on stooping or rising suddenly. Sometimes, only the upper nasal field would blur. The left eye was normal, the vision 6/6 and J1. The general physical examination was negative. The patient smoked cigarettes to excess. The right eye showed clear media, slight arteriovenous compression, and mild retinal edema above the disc. The disc was slightly swollen (about 1 diopter). The macula was normal. There was one retinal hemorrhage along the ascending temporal artery, 1 disc diameter from the disc, and up and in there were some fine white dots in the retina. The vision was normal. The patient was given amyl nitrite, and a paracentesis of the cornea was done, for it was thought that the retinal arterial circulation was impaired. She was given sodium nitrite intravenously daily for one week. After 10 days the

patient was seen again. She had had one blurring spell, and the retinal picture was unchanged.

## NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

January 3, 1944

DR. SIGMUND AGATSTON, *presiding*

### TWO METHODS OF GLAUCOMA SURGERY

DR. FRANK BURCH's motion picture on this subject comprised the first part of the instructional hour.

### LACRIMAL-SAC OPERATIONS

DR. THEODORE S. BLAKESLEY's motion picture on this subject completed the instructional hour.

### MODIFICATION OF THE CORNEAL SECTION IN CATARACT SURGERY

DR. JOHN H. BAILEY read a paper on this subject which has been published in the *Journal* (1944, v. 27, Nov., no. 11, p. 1253).

*Discussion.* Dr. George Epstein asked whether the healing period is prolonged with this section.

Dr. Daniel Rolett stated his belief that half the success of a cataract operation depends on a proper corneal section. He has devised a knife which makes, with a single sweep, a corneal incision of any size, the knife barely penetrating the anterior chamber. Details will be published shortly.

Dr. Sigmund Agatston inquired whether this method of making the section is not time-consuming.

Dr. Bailey replied that healing time is shortened and that while at first his method of making the section does take longer, experience permits greater speed. One of the advantages is the reduced danger of loss of vitreous, because each portion of

the flap is sutured before the next one is begun, and there are three smaller openings, temporarily closed prior to removal of the cataract, instead of one large opening.

#### INTRANASAL DRAINAGE FOR CURE OF CHRONIC TEAR-SAC INFECTION

DR. DAVID MORGENSTERN believes that enlarging the opening in the tear sac to the same size as the bony opening is the greatest difficulty in any intranasal technique for cure of chronic tear-sac infection. To surmount this difficulty, particularly when the sac is scarred or thickened, it is fully opened first by a transcanicular incision.

By placing the forefinger over the tear sac, one can feel the bony margin surrounding it as well as an instrument inserted into it either through the canaliculus or through the nasal cavity. Under the guidance of the palpating forefinger, a thin knife passed through the dilated canaliculus cuts an inverted U-shaped incision in the tear sac against the firm backing of the bony lacrimal fossa. A probe is then pushed through the lacrimal bone into the nasal cavity to guide increasingly larger operating hooks, ends bent at 90 degrees, which are slid along this probe through the bone into the sac. Palpating with the forefinger of the free hand at the inner canthus, the operator feels for movement of the largest hook used last. Under guidance of touch, the bony lacrimal fossa is completely broken down. An inverted U-shaped flap is thus freed from its bony attachment. Saline irrigations turn this flap down into the newly formed bony opening.

To combat closure as well as to reduce infection, a large hook, insulated except at its bent end, electrocoagulates the bony opening and the tear sac. The current is applied lightly where the flap has been turned down. This flap helps safeguard

the permanence of the bottom of the bony opening and aids in epithelization.

Since there is a minimum of tissue destruction and bleeding, this procedure is performed in the office, the patient leaving after a short rest.

*Discussion.* Dr. Benjamin Easternman asked how cauterization of the sac is avoided and how stricture due to cauterization of the canaliculi is prevented.

Dr. John H. Bailey inquired whether Dr. Morgenstern had experienced closure of the opening.

Dr. Morgenstern said he found that palpation of the electrode indicates its position and locates the area to be cauterized. If inadvertently an undesired area is cauterized, passage of a long bent needle through it into the bony opening combats possible stricture. Irrigation every 10 days will maintain patency.

The initial placement of a flap at the bottom of the bony opening safeguards against closure of the aperture, but if there is narrowing or a tendency to close, recoagulation will correct it.

Leon H. Ehrlich,  
*Secretary.*

#### CHICAGO OPHTHALMOLOGICAL SOCIETY

January 17, 1944

DR. VERNON M. LEECH, *president*

#### CLINICAL MEETING

Presented by the Department of Ophthalmology, University of Chicago

PROGRESSIVE NUCLEAR EXTERNAL OPHTHALMOPLÉGIA (GOWER AND VON GRAEFE)

DR. WILLIAM ROSENBERG presented F. G., a woman aged 37 years, who was seen for the first time on September 16, 1943, with a complaint of drooping of the eyelids. Ptosis of the upper lid of the

right eye started when the patient was 14 years old. The lid of the left eye began to droop in January, 1943. At that time severe retrobulbar and occipital headaches began to occur about once a week, associated with an increase in the ocular symptoms. The family history was non-contributory.

No facial asymmetry was noted. The corrected visual acuity was R.E. 20/25; L.E. 20/20. The palpebral aperture of the right eye measured 5 mm.; that of the left, 3 mm. The eyes were parallel in the primary position, and there was great limitation in the range of extraocular movements in all directions. Pupillary reactions were normal. The accommodative mechanism was normal, as was the remainder of the ocular examination. Following the administration of 1 mg. prostigmine as a therapeutic test, no subjective nor objective improvement was noted. Routine laboratory tests gave normal reactions. Neurologic examination revealed nothing further. The treatment was of nonspecific nature.

#### TRAUMATIC SCLERAL RUPTURE AND RETINAL DETACHMENT

DR. WILLIAM ROSENBERG said that L. A., a woman aged 26 years, was seen on September 9, 1942. She stated that she had struck her right eye with a cosmetic brush two weeks before. She had had mild pain and almost immediate blurring. The vision was R.E. 20/100; L.E. 20/13-4.

Examination revealed a huge temporal disinsertion which extended from the 7- to the 11-o'clock position. The patient was admitted to the hospital and remained at absolute bed rest until September 11th, when a microcoagulation operation was performed. Although the operative reaction was satisfactory, the retina remained elevated in the periphery and the disinsertion did not flatten. On September

25th, five microcutting perforations were made in the sclera and the lower temporal quadrant in an attempt to release subretinal fluid. The patient was discharged on October 8th, and followed in the out-patient clinic. The retina remained elevated temporally, although excessive chorioretinal scarring was noted. The vision was 20/100.

The patient was readmitted to the hospital on November 15th for further surgery, and the following day it was noted that an arcuate scleral rupture was present, parallel to and 8 mm. from the limbus, lying under the inferior and external-rectus-muscle bellies and extending from the 5:30- to the 10-o'clock position. This rupture was sutured and several cutting diathermy punctures were made in the inferior temporal quadrant to permit escape of a moderate amount of subretinal fluid. Visual acuity improved to 20/40, but there was little improvement in the field of vision; the retina still appeared elevated, although there was no apparent motion on movement of the eye.

The retina remained attached and considerably flattened, although there was slight elevation beyond the line of diathermy application. On December 9, 1943, vision was R.E. 20/30+3; L.E. 20/16. The patient had resumed her normal activities and had noted no further difficulty.

#### ESSENTIAL ATROPHY OF THE IRIS, BILATERAL

DR. WILLIAM ROSENBERG said that R. T. M., a 10-year-old boy, came to the Clinic on November 10, 1943, complaining of poor vision in each eye since birth. Corrected vision was R.E. 20/30+1; L.E. 20/50+2.

Examination revealed essentially smaller corneas than normal; each measured 9 by 9 mm. The slitlamp showed bilateral extensive scarring, stretching, and atrophy of the irides with shallow chamber

angles, obliterated in places by anterior synechiae. There were many posterior synechiae and pigment proliferations, and many iris holes and pigment deposits on the lenses. The fundi appeared normal. Bjerrum fields, with 3/1000 isopter, were normal. The tension was R.E. 26.5 mm.; L.E. 20.5 mm. Hg (Schiotz). With the Soutter tonometer the tension was 24 and 26 mm., respectively. It was felt that congenital iris colobomata might have been present at birth but that these were now masked by the extensive pathologic changes; or that the changes might have been secondary to prenatal ocular inflammation.

#### METASTATIC MENINGOCOCCIC ENDOPHTHALMITIS

DR. WILLIAM ROSENBERG presented J. W., a girl aged 18 years, who had recovered from meningococcic meningitis. Treatment had consisted of anti-meningococcic serum and sodium sulfadiazine in adequate doses. Atropine sulphate, homatropine, and hot compresses were used on the eyes irregularly.

On examination, the vision was ability to see hand movements at about 3 feet in each eye. There were dense exudative masses lying behind each lens. Typhoid-fever therapy was instituted, and atropine sulphate was instilled in each eye every 3 hours. Penicillin administered by iontophoresis was given for 25 days, with slight improvement in the right eye within 8 days. After 16 days there was definite evidence of recession of the pathologic process in the right eye, but not in the left, although there was some subsidence of the inflammatory reaction. Improvement continued gradually, and on December 29th, the vision was R.E. 20/30-3; L.E. ability to see hand movements at 3 feet. Light projection was accurate with the left eye, with satisfactory red and green perception.

#### TUBERCULOUS IRITIS, BILATERAL

DR. BARBARA SPIRO presented C. C., a Filipino aged 45 years, who had been seen in October, 1942, and who gave a history of failing vision for several months, associated with continuous headaches. The vision was R.E. 20/50; L.E. 20/30, with correction. There was evidence of severe bilateral iritis with almost complete posterior synechiae. Laboratory tests gave negative reactions, and biopsy examination of a lymph gland showed only nonspecific chronic inflammatory changes. Under treatment with foreign proteins and vasodilators the vision gradually improved and, following typhoid-fever therapy in November, refraction under cycloplegia revealed vision of 20/16 in each eye. A satisfactory examination of the fundi was then possible. Pigment clumping and rarefaction of choroidal pigment were noted as well as vitreous floaters in the left eye. Following a course of old tuberculin, starting with .0001 mg. and increased to 2.5 mg., he remained free of symptoms of uveal activity. Biopsy specimen of an enlarged lymph gland in October, 1943, again showed nonspecific chronic inflammatory changes, but tubercle bacilli were found in smears from an inoculated guinea pig.

#### KAYSER-FLEISCHER RING OF THE CORNEA IN HEPATOLENTICULAR DEGENERATION

DR. BARBARA SPIRO said that S. R., a white man aged 32 years, had a diagnosis in 1940 of Wilson's hepatolenticular degeneration. One year later a typical Kayser-Fleischer ring was found when he was seen in consultation in the Eye Department.

#### SYMPATHETIC OPHTHALMIA

DR. BARBARA SPIRO presented J. O., a white man aged 64 years, shown before this Society in 1941 and 1942, as a histo-

logically proved case of sympathetic ophthalmia, occurring 25 years after the original injury. The sympathogenic right eye was removed in 1941, when the left eye began to show signs of acute inflammation. Following enucleation the patient was treated with cycloplegics locally, sulfonamides by mouth, and mapharsen intramuscularly. For 23 months there followed a course of slowly subsiding activity in the left eye. There had been no activity for the past six months, and therapy was stopped eight months ago. Corrected vision was 20/20.

#### BILATERAL CENTRAL CHOROIDITIS

DR. MAURICE J. DRELL presented I. C. D., a white woman, aged 62 years, who said that since May, 1943, there had been progressive diminution in vision, with metamorphopsia. Vision with correction was 20/100 in each eye. General physical examination was negative except for mild arteriosclerotic changes and bilateral macular disease. The foveas were replaced by funnel-shaped excavations at the bottom of which was seen red mottled choroid with scattered whitish plaques. Surrounding the foveas was a doughnut-shaped area of mild edema. Campimetry disclosed a central scotoma on each side with the 1/1000 white target.

#### BILATERAL HYPERTENSIVE RETINOPATHY FOLLOWING TOTAL SYMPATHECTOMY

DR. MAURICE J. DRELL said that M. J. W., an obese white man aged 42 years, was seen in August, 1943, following an attack of dizziness four days previously, at which time he noted diplopia and drooping of the upper lid of the right eye. Six months previously he had had a spontaneous subconjunctival hemorrhage of the left eye. Except for occasional headaches, no other symptoms were elicited.

The corrected vision was 20/16 in each

eye. The lid of the right eye drooped moderately. Fixation with the right eye was preferred, with a 20-degree divergence; with the left eye fixating, the divergence was 15 degrees. Motion of the right eye was limited in all directions except to the right and down. The pupil of the right eye was larger than that of the left, and reacted more slowly. The fundi showed bilateral marked hypertensive neuroretinopathy with papilledema, great arteriolar attenuation, spasms, exudates, and hemorrhages. The blood pressure was 190-200/150-165 mm. Hg.

As it was thought that the patient represented a medical emergency, sympathectomy was suggested. Six weeks after onset, while the patient was at bed rest awaiting surgery, the ophthalmoplegia cleared almost completely within a period of less than 24 hours. Smithwick sympathectomy was performed in two stages. Recovery was uneventful and the patient resumed his work six weeks after surgery. The blood pressure was then 110/84 when standing and 134/96 when recumbent. The external ocular movements were unrestricted. With the red-glass test there was separation of the images only when looking in the extreme left-and-up position of gaze. Hypertensive changes were still present in the fundi, but to a considerably less extent.

#### OCULAR TOXOPLASMOSIS

DR. MAURICE J. DRELL said that N. M. D., a white woman aged 26 years, had had glasses prescribed for a mild refractive error in October, 1942. No ocular pathologic change was noted. In August, 1943, she returned with a history of blurring of the vision of the left eye of 3 days' duration. The corrected vision was R.E. 20/13; L.E. 20/30, slowly. The right eye was normal. The left eye showed a C-shaped raised area of choroiditis, deep to the retinal vessels, butterfly in appear-

ance, and mottled with pigment disturbance, apparently made up of a number of smaller confluent foci, and enclosing the macula in the concavity of the C. Campimetry showed an absolute paramacular defect almost exactly duplicating the lesion. During the ensuing two weeks the lesion extended to include the macula. The vision of the left eye decreased to 20/200. During the following two months the lesion extended in spite of all therapy until it reached a size of 6 to 8 papilla-diameter radius about the disc. Many fine vitreous floaters appeared, and biomicroscopy showed innumerable fine pigment keratitic precipitates and a plus aqueous ray.

Extensive physical and laboratory examinations showed nothing of significance. Treatment consisted of atropine, nitrites (both orally and parenterally), proteolac, and a course of sulfathiazole. Finally the patient was hospitalized and given sulfadiazine and typhoid vaccine, with a rise in temperature to over 104°F. on three occasions. After the second of these, she showed subjective improvement and the vision improved to 20/70. Since then the vitreous has cleared, the pigment keratitic precipitates have practically disappeared, and the fundus lesion appeared to be inactive. The vision was 20/200. The rabbit-skin protection test for toxoplasmosis was reported at about the time of the typhoid injections.

The only history of contact is that chickens were kept in the yard of her downstairs neighbors. These had "colds" last summer, with sore eyes, and "tended to bury themselves in the ground."

#### OCULAR TOXOPLASMOSIS

DR. MAURICE J. DRELL said that D.N.C., a white man, aged 25 years, was seen in December, 1943, with a history of intermittent loss and return of vision.

During the attacks the patient saw moving brown spots before the eyes. There had been no other symptoms. He stated that a number of years ago he raised rabbits as a hobby.

Corrected vision was R.E. 20/50; L.E. 20/200. Many vitreous floaters were present. The fundi showed many heaped hyperpigmented and atrophic chorioretinitic patches (0.25 to 2 papilla-diameters in size) throughout the fundi, with involvement of both macular areas. There were also several bands of proliferating retinitis. Biomicroscopy showed a rare cell in the left anterior chamber. All laboratory and X-ray examinations were negative. The rabbit-skin protection test for toxoplasmosis was reported strongly positive.

#### OCULAR TOXOPLASMOSIS

DR. MAURICE J. DRELL said that B. B. S., a white woman aged 25 years, gave a history of poor vision in the right eye of 7 days' duration. On examination, the vision R.E. was perception of hand movements at 1 foot. There was a ciliary flush. Keratitic precipitates were grossly visible. The pupil of the right eye was irregular and larger than that of the left eye, and reacted slowly. The fundus showed a marked vitreous haze, through which could be seen a raised area of yellow-white exudative choroiditis surrounding the disc and extending past the macula. There were several small hemorrhages at its edges. Biomicroscopy showed many keratitic precipitates and many cells, and 2-plus aqueous ray, as well as posterior synechiae at the 2- and the 6-o'clock positions. On the Bjerrum screen an absolute right central scotoma of 10 to 20 degrees was elicited, extending outward to include an almost complete inferonasal-quadrant anopsia.

The synechiae were severed with sub-

conjunctival epinephrine. Local instillations of atrophine were given, and brewer's yeast was administered by mouth. Extensive etiologic investigations showed nothing of significance. There was a daily rise of temperature to 99°F. The red blood cell count fell from 4.78 on November 3d to 3.92 on November 29th. At that time, the toxoplasmosis rabbit-skin protection test was reported as strongly positive. Injection of the patient's blood into a mouse gave no results.

The eye continued to improve slowly; the anterior-chamber reaction was minimal, and the fundus showed a large white atrophic peripapillary chorioretinitic lesion with hyperpigmented margins. The only relevant feature in the search for a contact was that someone in the family had raised chickens, a number of which had died quickly during the summer.

#### AFFERENT STURGE-WEBER-OSLER-DIMITRI SYNDROME

DR. MAURICE J. DRELL presented G. C., a white man, aged 41 years, who had been seen intermittently for 10 years. A tentative diagnosis of migraine had been made by the neurologic service in 1939. In November, 1940, he reported a history of blurring of the vision of the right eye for 5 days. The fundus of the right eye showed several hemorrhages in the depth of the physiologic cup, and numerous tiny hemorrhages scattered throughout the fundus. The veins were tortuous, moderately dilated, with compression at the arteriovenous crossings. The arteries showed slight uniform increase in the central light streak, but no definite attenuation. The fundus of the left eye was normal. Campimetry of the right eye revealed a paracentral scotoma. The visual haze of the right eye varied in intensity for a few weeks and finally disappeared. The hemorrhages were absorbed over a

period of six weeks. General physical examination, complete hematologic study, and X-ray films revealed nothing significant.

The patient returned in December with a history of recurrence of blurring in the visual field of the right eye. The vision was 20/13 in each eye. The fundus of the right eye showed tortuous dilated veins and attenuated arteries. In the macular region was fine new-vessel formation with a tiny hemorrhage just beyond the terminal twigs of two of these vessels. Campimetry showed a relative sector-shaped paramacular scotoma lying between the fixation point and the blind spot. The tension had always been normal. All laboratory studies were non-revealing. A port-wine type of nevus was noted on the lower lip. The blurring was present intermittently for 10 days, then the vision diminished to 20/200, a few more hemorrhages were found, and a dense centrocecal scotoma was present. Three days later the fundus had the appearance of a partial central-vein thrombosis with perhaps complete occlusion of the superior temporal branch, showing papilledema, exudates and sheetlike hemorrhages in the region of the distribution of the superior temporal vein, and smaller hemorrhages throughout the fundus.

Since then the disc had become flat, hemorrhages and exudates had been absorbed, the vision slowly improved to 20/16, and the scotoma thinned out. Therapy consisted of nitrites, potassium iodide, vitamin-B complex, and citrus juices. Following the development of the picture of vein occlusion, atropine was given on three different occasions as a retrobulbar injection.

It is possible that the clinical picture fits into the phakomatosis group, postulating the presence of an angioma of the ophthalmic vessels, with each recurrence



representing the result of an embolic phenomenon.

## SCIENTIFIC PROGRAM

### CORNEAL DYSTROPHIES

DR. ROBERT VON DER HEYDT presented a paper on this subject which was published in this Journal (1945, v. 28, Jan., p. 55).

*Discussion.* Dr. Robert J. Masters said that corneal dystrophies have a tendency to follow patterns of development that fail to be typical. Even in familial hereditary granular type they may exhibit a varied appearance in the eyes of the same individual or in members of the same family.

In 1940, A. Pillat, in an article in the *Klinische Monatsblätter für Augenheilkunde*, described a familial corneal dystrophy characterized by peculiar central flaky and peripheral lattice-shaped opacities in both eyes of the same individual. The central changes were described as peculiar crumblike opacities deeply situated in the stroma, not in the shallow portion under Bowman's membrane. This patient's sister had the same condition, and there was a history of eye disturbance in the father and grandfather. One might believe that Pillat's patients had mixed in the two eyes two types of dystrophy, granular and lattice-shaped, according to the classification of Bücklers. Pillat felt sure that his patients exhibited a new type of dystrophy.

The term dystrophy means defective nourishment and can be applied to many types of nutritional disturbance of the cornea, of senile, inflammatory, or occupational irritative origin, or of the hereditary type with which the term is usually associated. Davidson suggested that corneal dystrophies be classified as senile, secondary, occupational, and hereditary. In the senile type he would

put arcus senilis; in the occupational type, long-continued irritation due to chemicals. Regarding Fuchs's epithelial dystrophy, it is difficult to explain why so many elderly people have so few epithelial dystrophies, unless there is some hereditary tissue tendency that predisposes the cornea to development of the changes which typify Fuchs's epithelial dystrophy.

There is no question but that the most profitable study so far as dystrophies are concerned comes from repeated examination. Dystrophies are bilateral; those of hereditary type are inclined to progress; they are avascular. Certainly it is important before undertaking a cataract operation to make a thorough examination with the slitlamp to ascertain the condition of all the ocular tissues including the cornea. This leads to the question as to the experience of others who have operated for cataract upon eyes which exhibited a corneal dystrophy. How did the eye heal and what, if any, complications developed?

Dr. Sanford Gifford recalled a patient with very marked dystrophy on whom an intracapsular extraction was performed. Following operation she developed what looked like Fuchs's epithelial dystrophy. This does not develop until the guttata lesions are so advanced that the aqueous gets into the cornea. The operation apparently put the finishing touch toward development of the condition.

Dr. Vernon M. Leech stated that Dr. Masters mentioned the importance of careful slitlamp examination prior to operation for cataract. Faint corneal opacities, especially early dystrophies, stand out fairly well with oblique illumination when the pupil is large and black, but are difficult to see when the background is gray from cataract formation. He recalled the case of a woman who had had cataracts diagnosed, and before she would permit examination except for a glance

at her eyes with oblique illumination, she insisted on a general discussion of cataract surgery. She was assured that there was nothing to worry about; that the results were preponderantly good, vision could be restored, and so forth. When examination was completed, including slitlamp study, a bilateral central dystrophy was found, which caused modification of the prognosis on her cataract operation.

Dr. Peter Kronfeld said that the incident reported by Dr. Gifford had been observed in at least three cases at the Illinois Eye and Ear Infirmary. In two cases the picture was that of marked cornea guttata; in the third beginning epithelial changes were superimposed upon the cornea guttata.

In a case of that type observed by Dr. Terry of Boston, and reported before the New York Society for Clinical Ophthalmology, he also raised the question of what to do with the other eye. If he performed a cataract extraction he would fear that the second eye would take the same unfortunate course as the first.

Dr. Robert von der Heydt, in closing, replied to Dr. Masters, in reference to Pillat's case, if Bückler's classification is accepted, each of his three types presents a definite clinical entity. No one type resembles another if carefully differentiated.

In the picture shown of the incipience, there were lesions under Bowman's membrane and within the stroma. The crumb-like pattern is seen throughout the stroma and at all depths. In Pillat's case the central area may have been somewhat similar. However, there were no lattice lesions. The lines were radical and only at the limbus.

With regard to cornea guttata, there are many senile and presenile persons having disseminated guttata spots in the corneal center. There must be many hundreds before the endothelium is involved. This layer is the barrier membrane between aqueous and corneal stroma. The guttata lesions must be extremely numerous to cause an epithelial dystrophy.

The postoperative condition which may develop and which resembles Fuchs's epithelial dystrophy is due to accidental trauma to the endothelium by instruments. We find a similar condition in birth injuries; there is a milkiness of the whole cornea such as seen in the early stages of interstitial keratitis. It is not due to the fact that Descemet's membrane has ruptured, but to the splitting of the endothelial layer. When it re-forms the barrier function returns and the corneal stroma clears.

Robert Von der Heydt.

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## DIRECTIVES FOR ETHICAL DISPENSING

In the February issue of this Journal the writer discussed the ethics of dispensing lenses. The editorial created some comment, hence he thought that further consideration of the subject might be profitable. He suggested that the Section on Ophthalmology of the American Medical Association define acceptable methods and he touched briefly on some of the practices now employed. It is perhaps worthwhile to enlarge somewhat upon different possibilities for dispensing glasses. But before doing so, it might be well to generalize a little. In the first place, there should be no idea in the minds

of anyone that the question is primarily one of integrity. It must be obvious that if an ophthalmologist desires to capitalize unscrupulously on his patient, he can do this in many ways other than by taking a profit on glasses. For example, he may be entirely ethical in his dispensing of glasses and still have patients make unnecessary visits to his office, or he can perform operations that are not needed. There isn't anything against the law in an eye physician's taking a major part of the profit from the sale of optical goods, though he might need a retailer's license to do so. The question is whether this practice is regarded by physicians as fulfilling the best ideals of the profession.

A second point is that a sufficiently broad concept is necessary to allow for the differences of practice in different localities, chiefly as concerns urban and rural areas. This may have for its crux rather the education of the public than of the doctor. Urban peoples have, in general learned that the doctor's fee is largely for his opinion and advice, but in rural communities there is still a strong tendency for patients to think that they are paying for the medicine that they receive and not for the advice that they get. Likewise in small communities patients are far less willing to pay even a small fee for a refraction and a small amount for the glasses than to pay a bigger fee for glasses than for the other two combined. The necessity for the doctor to give something concrete in return for the patient's fee was so imbedded in the public mind that 30 years ago, even in large cities, some ophthalmologists made no charge if a new prescription was not given after the refraction!

The simplest method for the ophthalmologist is the one approved in the resolution passed by the Section on Ophthalmology of the American Medical Association in 1924, which indirectly endorses this method by stating that "we deprecate the selling of glasses by the ophthalmologist to his patients in communities where the services of reliable dispensing opticians are obtainable," namely that of referring his patients to a reliable dispensing optician. This method is surely above reproach if, by reliable we mean a nonrebating optician. The doctor makes a charge to the patient for his services to him and has no part in the financial transaction with regard to the glasses, though most opticians are glad to accommodate by charging less than the customary retail price to indigent patients on the doctor's request and by making any necessary changes in the

prescription for the doctor within a reasonable length of time. If the optician, as is sometimes the case, is willing to sell lenses on a doctor's prescription for less than the customary retail price, this also surely cannot be objected to since it reduces the cost to the patients and is a logical procedure, because the optician is relieved of the expense incident to his performing the refraction, if he be licensed to do so, or of employing someone to give this service. This method with the above modification should be endorsed by the Section.

Where such opticians are not available, the ophthalmologist should be permitted to dispense his own lenses and make a charge to the patient that would include his physician's fee plus a charge for the glasses sufficient to cover his overhead in dispensing them. This would seem to be as open a method as can be employed where there is no dispensing optician available, since it is quite possible to let the patient understand the elements in the charge so that there need be no hidden fee. Undoubtedly this method permits of as liberal an interpretation of overhead as the ophthalmologist sees fit, but here the assumption is that the physician is actuated by a desire to deal honestly with his patient and his obvious limit is the cost of similar glasses in his community. This method should be accepted as ethical.

A third possibility for those who do not care to undertake the necessary labor of fitting and adjusting glasses and of performing the other mechanical essentials in the dispensing of glasses is the employment of a technician to perform these functions and making a charge for the glasses sufficient to cover the additional outlay of the salary of this individual. This is essentially the same as number two and should be acceptable.

A fourth method is the employment of an agency which performs the functions

of dispensing for the physician, the entire financial transaction being handled by the physician who makes the charge to the patient for both his fee and for the glasses and pays the bill for the optical goods and services to the agent. If the ophthalmologist will reveal the expense elements in the transaction to the patient, there should be no objection to this practice.

A fifth method is that which has been discussed under "Agency dispensing" in a previous issue of this Journal. In this case the agency collects the fee for the cost of the glasses, which within certain limits is specified by the doctor, and returns any surplus to the doctor at the end of the month or charges his account with any deficit. The writer believes that this almost surely entails a hidden fee and that the ophthalmologist cannot exercise adequate control over the cost of the glasses to the patient, or, broadly speaking, over the entire transaction and he thinks that this method should not be approved.

A sixth manner of handling glasses is through a company owned and controlled by one or more ophthalmologists, perhaps as a stockholders' corporation. There are several such concerns under the control of well-known and respected ophthalmologists. By them they are undoubtedly conducted ethically and without profit to the doctor from the business of handling merchandise. In such circumstances the cost of glasses to the patient can probably be reduced materially and excellent service given. The possibilities of entering into a business for profit in this arrangement is certainly ever present and its acceptance as an approved procedure should be contingent upon the willingness of those engaged in the project to permit of scrutiny of the business by whatever body is responsible for the medical ethics of the community.

Finally, the practice of referring a patient to an optician who returns a percentage to the ophthalmologist merely for referring the patient to him needs no comment.

The writer again urges that the Section of the American Medical Association study the matter anew and present some positive directives on the subject of the dispensing of lenses.

Lawrence T. Post.

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### PROFESSIONAL CLAIMS BY BRITISH OPTICIANS

The controversy as to who should have legal right to test and prescribe for refractive errors is likely to live a long life. There are some ophthalmic physicians who would prohibit entirely the prescription of correcting lenses by refracting opticians; and, on the other hand, there are "optometrists" who would permit medical practitioners to undertake refraction only after passing a special examination to show their proficiency in the subject.

It may be remarked that the use, in the preceding paragraph, of quotation marks around the word "optometrists" is justified by the fact that, according to the meaning of the French word from which the title was borrowed, anyone who measures the refraction of the human eye is an optometrist, whether his right to do so rests upon medical or a nonmedical basis. The word is not employed by British opticians, and does not appear to prevail in any of the British dominions or colonies outside of Canada and Newfoundland, which have of course been influenced by contiguity to the United States. "Refracting optician" would be much more accurately descriptive and much more intelligible to the general public, although perhaps less in

harmony with the ultimate professional ambitions of those who coined the word "optometry." In Great Britain the expression "optical practitioner" seems at present to lead the field, although it might of course be used just as well by the grinder of lenses or by what is known in this country as the "prescription optician."

The recent tentative scheme of the British Government (not yet passed into law) for a complete nationalized health service led to the creation by British opticians of a special committee, called "The Beveridge Report (ad hoc) Committee (Optical Profession)," which in due course published a carefully reasoned report on the controversial issues involved as between the medical profession and the optician. This report, although now over a year old, is not perhaps familiar to most American ophthalmologists, and a summary of its arguments may possess value for many of our readers.

Parenthetically, as regards the optical problem, it is well to remember the effect of constitutional differences between Great Britain and the United States. In the United States, legislative experiment is favored by the existence of an independent legislature for each state; whereas in Great Britain the privileges of local self-government are from time to time delegated by the national government to local bodies such as the county councils and municipal authorities. Thus the decision whether to give official recognition to "optical practitioners" has rested in the hands of the central government.

Attempts made by the optical practitioners, in 1906 and 1927, to introduce a system of state registration were defeated, partly because the British Parliament showed little inclination to concern itself with the proposal, and partly because of very strong opposition by the medical profession. The parliamentary bill intro-

duced for the opticians in 1927 was studied by a "Departmental Committee," which we are told based its recommendation against the bill upon "the medical profession's promise that an efficient and comprehensive ophthalmic service would be available within a reasonable time."

British opticians have a sort of semi-official recognition in the fact that they have coöperated in the establishment of a register of optical practitioners whose work is accepted under the National Health Insurance administration. But the medical organizations of Great Britain have declined to participate in this arrangement, which is handled by a body called the "Ophthalmic Benefit Approved Committee," and in which the old mutual insurance organizations play an important part.

Five organizations, the British Optical Association, the Worshipful Company of Spectacle Makers, the Institute of Chemists-Opticians, the National Association of Opticians, and the Scottish Association of Opticians, conduct periodical examinations and issue diplomas as to proficiency in optical practice. These diplomas conform to a standard specified by the "Ophthalmic Benefit Approved Committee." The examinations cover theoretical and practical optics, subjective and objective methods of measuring refractive errors, optical apparatus including the testing of visual fields, anatomy and physiology, orthoptics, such knowledge of abnormal and pathologic conditions of the eye as is necessary for referring the patient to a physician, and lens grinding and fitting. In certain parts of the British Empire such an optical diploma "entitles the holder to admission to the state registry," although he has no such privilege in Great Britain.

The examination papers of one of the optical organizations, The Institute of Chemists-Opticians, are set, we are told,

under the supervision of the officials of the University of London. The optical Beveridge Report Committee quotes two ophthalmic surgeons, themselves examiners, as speaking highly of the standards of the examinations conducted for several of the optical organizations.

Opinions quoted from one of these ophthalmic surgeons (Tibbles), as given in the report, were expressed by him seven years ago in a letter to the *British Medical Journal*. This letter contained other statements of interest to students of the British situation. Tibbles asked, for example: "What is to become of the eye surgeons in the future, as they cannot possibly live on the small percentage of cases of diseased eyes, and at present the national health insurance patients, who form a big proportion of the population and formerly paid us fees themselves, are now sent to the optician, who can refer them to us if he thinks fit?" The other ophthalmic surgeon quoted is Lindsay Johnson, and it appears that his opinions were expressed eleven years before issuance of the report. In the interval, says the report, "All the optical examinations have been made of equal standard, and the standard has been appreciably raised."

The British optical societies, through their periodical examinations, are evidently making a sincere attempt to raise the standard of the refracting optician. If the sweeping governmental plan for socialized medicine is enacted into law, it seems possible that the services of British refracting opticians will be enlisted upon the basis of an important degree of professional recognition, in spite of the contention of many British ophthalmic surgeons that the optical practitioner should be utilized only under direct medical supervision.

The report of the "ad hoc" Committee of the British Opticians urges, as has been so often urged, and as is argued by

the optometrists of the United States, that the numerical strength of ophthalmic surgeons is entirely inadequate to provide for the needs of the general public. The "ad hoc" report quotes the records of the British Medical Association as showing that there are only "1,000 ophthalmic surgeons and ophthalmic medical practitioners to deal with the requirements of 45,000,000 people, including surgical and pathological work." The number of British optical practitioners is given as in the neighborhood of 7,000.

The report of the Committee devotes a good deal of space to the history of refraction, with a view to showing "that ophthalmic optics has developed as a distinct and individual field of work." Arguments along these lines, which have been indulged in by both the medical and the optical protagonists in the general controversy, are beside the mark and are certainly not of vital significance. In the days in which physicians advised their patients to choose lenses in any optician's shop, it is quite certain that the said opticians did nothing more scientific than to grind or sell lenses. On the other hand, the outstanding pioneer in the refractive development of the past 85 years was a Dutch physician, F. C. Donders, who conducted his exhaustive investigations within the eye department of a university medical clinic.

The vital question now is how best to serve the public interest. The ultimate effect of the controversy between optician and physician, so far as controversy really exists, is likely to be a steady improvement of the standards of refraction work performed by both groups. Optometry propaganda in the United States has been an added stimulus in the movement for better standards among ophthalmic surgeons. In this country, in spite of the fact that there is much room for improvement, the standard of refraction work among ophthalmic surgeons is far ahead

of the standard among refracting opticians or optometrists, although a few states have done much to elevate the level of optometric practice within their borders.

There is some logic in the argument that physicians should not refract without a certificate of proficiency in this activity. But there is a very much greater need for restricting the optometric license, throughout the country, to those whose general and professional standards of education make it safe to entrust them with such responsibilities. It is rather probable that the centralized British system will show more rapid improvement, and greater justification for public confidence in the certified refracting optician, than the activities of optometric boards of examiners throughout the United States.

Another weakness of the report issued in behalf of the British opticians lies in its emphasis upon the fact that much of the time of the ophthalmic surgeon is devoted to general surgical and medical care of his patients, as distinct from the measurement of refraction. The report appears to overlook entirely the other fact that the optician is usually a merchant who devotes a great proportion of his time to purely commercial and mechanical phases of his business.

Sooner or later the general public will act as umpire in the tug-of-war between ophthalmologist and refracting optician, as it did a hundred years or so ago in the battle for the establishment of a dental profession divorced from the practice of medicine so far as licensure was concerned. Apart from questions of science and philanthropy, the two professional groups have an economic stake in the outcome; and the public, ignorantly or wisely, will in turn also decide upon the basis of self-interest.

Cost of service will receive due consideration, but, in the end, quality of

service will be the deciding factor. Improvement in professional standards, in either camp, will not in the long run lower but raise the cost of service so far as individual refractive prescriptions are concerned, and yet may ultimately lower the cost of service by reducing the frequency with which customers or patients are reexamined or pass from one examiner to another. Those who fear the results of competition should recognize that improvement in any line of service to the public usually broadens recognition of need and therefore increases demand for such service. Economic pressure may force a considerable section of the public to seek for a while the apparently cheaper type of service; but, on the average, those who are able to pay for better and more expensive service will usually be willing or eager to do so. W. H. Crisp.

### REHABILITATION OF THE WAR-BLINDED

American war-blinded soldiers in World War II will not return to their homes without having had the benefit of the best possible training in matters connected with their adjustment to civilian life and their future as civilians. Under the direction of The Surgeon General of the United States Army, a program has been set up at Old Farms Convalescent Hospital (Sp), Avon, Connecticut, which will return the blinded service man to his community, with a knowledge of his own abilities and with a desire to resume his normal place in his own community life.

New methods of training the blind are being developed at Old Farms—methods which are designed to fit the individual trainee, and designed for the veteran—using as a basic principle the necessity of seeing to it that the blinded veteran regains completely his own self-confidence. The program aims at showing the man



that, though blinded, he need make very little change in his plans for the future.

The soldiers blinded in this war are for the most part young men and, as young men, they of course have all of the ambitions, dreams, and plans that American young men have. Their blindness has come to them with a terrible suddenness. There has been no time for them to sit down to think or plan prior to its arrival. The result is that when the soldier is told that he is blind, he at first sees toppling about him all of his future and feels that he is doomed to a life of dependency and helplessness. The Old Farms program in conjunction with programs at Valley Forge and Dibble General Hospitals, which treat the men surgically and medically, has done much to remove this feeling and the soldier goes back to his civilian life with an ambition to get to work and to carry on with his business of living.

Old Farms is under the command of Col. Frederic H. Thorne (MC), one of the Army's outstanding ophthalmologists, and is staffed by Army officers, enlisted personnel, and civilian instructors who are trained not only to work with the blind, but to work with blinded soldiers. The program covers a period of 18 weeks, which is felt to be the minimum time in which the best possible job can be done in social adjustment and the maximum time it is possible to hold most of these men in such a program without taking the risk of institutionalizing them in their outlook. All Army blinded will go to Old Farms prior to discharge. The program is four-fold. In the first place it involves general orientation, and in this orientation emphasis is placed on adapting methods to the man, not the man to preconceived methods. One of the basic things done is to train these soldiers to go about the grounds of the Hospital without canes and without aids of any

kind. In the accomplishment of this purpose lies a great deal of the self-confidence which Old Farms wants to put into the men. They learn that, in familiar surroundings, they can go where they want to go, when they want to go, and as they want to go, without depending on any one with sight. The result is that many visitors to Old Farms have been startled to find they have been talking to men whom they have met on the grounds who were blind and who they had no idea were blinded. The second part of the training involves attendance at classes. A wide variety of classes, which includes virtually anything that any man might want to know more about, is available. Work with power machinery such as drill presses, lathes, and other machines, agricultural work, industrial-therapy work in which the hobby angle is stressed, music, Braille, and dozens of others make up the approximately 45 courses. The man is encouraged to take as many of them as he will and can, and to develop new interests if former ones seem inadequate to his new status. Throughout, however, while the man has advice and guidance, his final decision as to his future is his own. An important factor of the courses has been a practical phase in which men are sent into Hartford factories and war plants doing the work of sighted men, beside and in competition with sighted men, and making a record in the doing which has considerably startled local industrialists. Their production record is high and their accident record is zero. The third phase of the work covers the all-important—to the American boy—problem of athletics. Gone are the days of setting-up exercises and long walks. Instead, these war veterans find they can, with almost no exception, take part in and enjoy the sports which they enjoyed before they became blinded. A well-rounded athletic program includes

horseback riding, golf, bowling, roller skating, ice skating, winter sports, swimming, gymnasium work, wrestling, boxing, fishing, and many other activities, and the men soon find that they can still enjoy what they did.

The final division of the program is that of recreation, and under the direction of competent Red Cross Field Representatives, an extensive recreational program is provided. The men go to dances, concerts, dinner parties, plays, movies, sports events, and they play cards, checkers, and all the many games they knew before. Here again the man finds that his blindness does not mean that he will spend his life as a drag on any party he may attend. He finds that here again normalcy is possible.

When the man finishes his 18 weeks at Avon he is given a certificate which certifies his readiness to return to civilian life, having fulfilled the standards of social adjustment set up for him by the Army. He returns with a confidence in his own ability to make a success of his life and he returns with a desire to do something more than exist in endless days to come on a pension. However, the real job will be done by the public, for these men returning to their homes in full knowledge of their potential abilities will expect and will deserve the chance to use them, and if communities will accept them as normal and take them into their normal community life and avoid the silly and, to the men, objectional displays of pity and sympathy so common with the blind, these blinded men will make a success of their lives and will make citizens of whom their communities may well be proud. However, the answer will lie, not with the Army, not with the man, but with his community.

When he leaves Avon he leaves with the basic training necessary, and he becomes the active interest of the Veterans

Administration. It is the job of the Veterans Administration to see that the man receives any additional or specialized training he may want; that his rights under the GI Bill of Rights are protected; that he is given assistance in locating a suitable job, and that he is given the aid and counsel which will mean the proper start. Once he leaves Avon, he is a discharged soldier and the Army loses the right to aid him further, but the men at Old Farms have found that the interest of the Army does not end with his discharge, and there is rapidly growing up something which resembles closely the alumni spirit to be found in schools and colleges of this country.

The Army, the blinded soldier, the Veterans Administration, and the public make up a team which, together, can end for all time dependency and helplessness for these men.

William A. Jameson, Jr.  
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Public Relations Officer.

## BOOK NOTICE

STUDIES OF CIRCULATORY DISTURBANCES, PULSE WAVE VELOCITY AND PRESSURE PULSES IN LARGER ARTERIES IN CASES OF PSEUDOXANTHOMA ELASTICUM AND ANGIOID STREAKS. By Uno Carlborg. Acta Medica Scandinavica, Suppl. CLI. Paper covers, 209 pages with 19 illustrations. Uppsala, Appelbergs Boktryckeri A.-B. 1944.

As the title suggests, this monograph is not primarily an ophthalmologic treatise. This excellent piece of clinical investigation does, however, have ophthalmologic interest, just as it has interest for the dermatologist, internist, and vascular physiologist. The author seems to

have integrated well the contributions of each of these fields in the present study. The first of the two parts of the paper is devoted to the clinical aspects of the problem. There is an extensive historical review which includes most of the 130 known cases of associated pseudoxanthoma elasticum and angioid streaks. The author uses the name "Grönblad-Strandberg's syndrome" for the ophthalmologist and dermatologist, respectively, who elucidated this association. He presents a careful picture of the skin and eye findings. In both organs, the pathologic processes consist in degenerative changes in elastic connective tissue.

Fifteen typical patients are presented, in detail, and the author was able to demonstrate that symptoms of peripheral circulatory insufficiency were common. Pathologically, the vessels of the extremities, the abdominal viscera, the eye, and the skin showed elastic-tissue degeneration. Cardiac and aortic findings, on the other hand, were not marked, and the author points out that in these structures elastic tissue is relatively sparse.

The etiology of the disease is unknown, except for the facts that it is a dystrophy of the elastic tissue throughout the body, and that it is hereditary, being transmitted as a recessive. Blood chemistry, metabolic, and other laboratory studies show no characteristic abnormalities, nor are the circulatory symptoms pathognomonic. Hemodynamic studies undertaken by the author did, however, show characteristic features. The second part of the monograph deals with these observations. Carlborg was able to demonstrate decreased pulse-wave velocity. Sphygmograms showed characteristic abnormalities, and oscillometric studies showed abnormally

low curves. Comparisons with normal individuals and with senile arteriosclerotics revealed the changes to be, on the whole, peculiar to the group of patients under investigation. The author holds that the same explanations advanced for the altered physiology of the circulation in arteriosclerotics cannot be applied to these patients; since they are too young in most instances, and since the author was unable to find any reasons to suppose that there was actual narrowing of the caliber of the vessels. He concludes that the altered hemodynamics in patients with the Grönblad-Strandberg syndrome are the result of the elastic degeneration in the muscular vessels. This atrophy permits the damping, "shock-absorber" effect of the vessel musculature (hysteresis) to play a dominant role in pulse-wave transmission, and explains to a great extent the decrease in pulse-wave velocity and the other abnormal circulatory findings.

The author feels that this study contributes in a measure to the knowledge of the physiology of the circulation, since this disease enables one to study the manner in which the vessels function, *in vivo*, in the absence of the elastic component. He feels that too little emphasis has been placed, hitherto, on the role of smooth-muscle hysteresis.

The monograph represents clinical investigation on its highest plane, characterized by painstaking care in each detail. It may well be considered a model for good clinical research, and should constitute interesting reading for a student of any of the medical specialties from which the author has drawn his material.

Benjamin Milder,  
1st Lt. (MC), A.U.S.

# ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

## CLASSIFICATION

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| 1. General methods of diagnosis                        | 10. Retina and vitreous                                |
| 2. Therapeutics and operations                         | 11. Optic nerve and toxic amblyopias                   |
| 3. Physiologic optics, refraction, and color vision    | 12. Visual tracts and centers                          |
| 4. Ocular movements                                    | 13. Eyeball and orbit                                  |
| 5. Conjunctiva   | 14. Eyelids and lacrimal apparatus                     |
| 6. Cornea and sclera                                   | 15. Tumors   |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries   |
| 8. Glaucoma and ocular tension                         | 17. Systemic diseases and parasites                    |
| 9. Crystalline lens                                    | 18. Hygiene, sociology, education, and history         |
|  | 19. Anatomy, embryology, and comparative ophthalmology |

### 6

#### CORNEA AND SCLERA

Friedenwald, J. S., and Buschke, W. Mitotic and wound-healing activities of the corneal epithelium. *Arch. of Ophth.*, 1944, v. 32, Nov., pp. 410-413; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42.

This investigation was undertaken in an effort to discover the physiologic controls and biochemical aspects of mitotic and wound-healing activities. The method of assay of mitosis depends upon routine counts of a meridional strip of rat cornea. In normal young adult rats there are approximately 5,000 to 6,000 mitoses per cornea, or 100 mitoses per strip counted. Normal variations range from 50 to 200 mitoses per strip. However, mitotic activity cannot be gauged solely by the number of mitoses present at a single moment, since that number is affected both by the rate at which cells enter mitosis and by the rate at which cells pass through the mitotic cycle.

Other investigators have shown in other organs that colchicine arrests the

mitotic cycle in metaphase but does not influence the rate at which cells enter mitosis. Hence, the number of cells observed in mitosis at a fixed time after administration of colchicine furnishes a measure of the rate at which the cells enter mitosis. By a combination of methods it was found that the duration of mitosis in the normal cornea was about seventy minutes and the intermitotic interval for the basal cells approximately one week. Under suitable conditions the mitotic rate could be maintained almost at the normal level in the enucleated eye kept in a moist chamber in the incubator.

Histamine, acetylcholine, physostigmine, pilocarpine, carbaminoylcholine chloride, and atropine were found to be without effect on the mitotic activity. Epinephrine, on the other hand, produced a notable inhibition of the entrance of cells into mitosis, without disturbing the development of the mitosis once it had begun. By intramuscular injection of epinephrine in peanut oil, mitosis in the cornea could be suppressed for many hours. Ephedrine had a similar effect.

The number of cells observed in mitosis after superior cervical sympathectomy was normal in simple counts but was greatly reduced after administration of colchicine. Cocaine, ether, and barbiturates produced notable inhibition of the initiation of mitosis. Mechanical damage to less than 0.1 percent of the epithelial cells of the cornea caused inhibition of mitosis in the remaining, apparently uninjured, cells for several hours.

Ultraviolet light and radiation with beta rays of radium also inhibited the onset of mitosis. Decrease in temperature to 30° C. did not make it impossible for cells already in mitosis to complete their division. Deficiency in vitamin A decreased the rate of mitosis and, to a somewhat lesser degree, the progress through the mitotic cycle. Up to the present the authors have encountered no agent which produces an increase in the rate of mitosis though with many substances there is an overshooting of the normal rate of mitosis for a brief period after recovery from inhibition.

The second part of the paper deals with wound healing. In order to separate the primary phenomenon of wound-healing from the inflammatory reaction and secondary infection of large wounds, the authors chose for study minute epithelial defects produced by needle pricks of the corneal surface. One hour later there was no visible change. Two hours after the injury the basal marginal cells had changed their orientation and lay with their long axes radial to the hole. Three hours after the injury the majority of the holes were covered. After the initial period of lag of one hour, the rate of cell movement in closing these small holes was 0.25 microns per

minute. The wound-healing phenomenon proceeded equally well in enucleated eyes kept either in a moist chamber or in aerated solutions in the incubator.

Wound-healing in the corneal epithelium occurred at a pH of from 4.5 to 9.5. The process was much less sensitive to pharmacologic interference than was mitosis. Local anesthetics such as cocaine and tetracaine inhibited the process, but of the general anesthetics administered systemically only morphine had a measurable effect. Ultraviolet radiation did not inhibit wound healing except in doses producing sloughing of the epithelium. Anoxia, sodium cyanide, and sodium azide inhibited the healing process. Tables are given which report on many other changes than those mentioned. (References.) R. W. Danielson.

Mann, Ida. Ariboflavinosis. *Amer. Jour. Ophth.*, 1945, v. 28, March, pp. 243-247. (3 color plates, references.)

Pannabecker, C. L. Keratitis neuroparalytica. Corneal lesions following operations for trigeminal neuralgia. *Arch. of Ophth.*, 1944, v. 32, Dec., pp. 456-461; also *Trans. Sec. on Ophth.*, *Amer. Med. Assoc.*, 1944, 94th mtg.

This is an analysis of the corneal lesions complicating 878 operations for trigeminal neuralgia. Corneal anesthesia and lagophthalmos are the important factors in the production of corneal lesions. Neuroparalytic keratitis may be classified as follows: (1) parenchymatous, with absence of ulceration; (2) superficial, a benign form, with areas of desquamation; (3) ulcerative, with a tendency to regression and moderate corneal damage; and (4) persistent. Exposure keratitis is a degenerative condition due to desiccation result-

ing from lagophthalmos. Lagophthalmos may develop as the result of surgical trauma of the facial nerve. Corneal anesthesia and lagophthalmos combined give the greatest incidence of corneal lesions (65 percent). Operations complicated by the presence of neoplasms are more likely to result in paralysis of the facial nerve and exposure keratitis. The patient with corneal anesthesia following operation for trigeminal neuralgia is most susceptible to development of neuroparalytic keratitis during the first few months after operation, but the disturbance may occur much later. Early tarsorrhaphy should be performed in doubtful or suspected cases and the lid be thus partially closed for six months. (4 tables, references.)

John C. Long.

# 7

## UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Nuri Fehmi Ayberk. Adie's syndrome. Göz Klinigi, 1944, v. 1, no. 6, p. 227.

After quoting some literature the author gives the differential points between Adie's syndrome and the Argyll-Robertson pupil.

Joseph Igersheimer.

Pendse, G. S. Allergy in tubercular affections of the eye. Indian Jour. Ophth., 1944, v. 5, Oct., pp. 63-66.

A general discussion of ocular tuberculosis and tuberculin treatment is followed by report of two cases in which uveitis was thought to be due to tuberculous allergy and recovered after local and general treatment, the latter including injection of tuberculin.

W. H. Crisp.

Rahim, S. A. A case of polycoria. Indian Jour. Ophth., 1944, v. 5, Oct., p. 67.

A boy aged 12 years presented the conditions shown in illustrations of the two eyes. In the right eye, with very poor vision, only a small amount of iris was present, in the form of a K-shaped figure probably connected at several points with the ciliary body. The optic disc was deeply cupped, the cornea slightly larger than that of the left eye, and the tension 30 mm. (instrument not mentioned). The left eye, with vision of 6/24, showed a spindle-shaped pupil at the lower inner quadrant next to the limbus, a smaller irregular pupil at the lower outer quadrant, and five holes in the iris tissue which occupied a little more than the upper half of the pupillary area and was connected by a bridge with the ciliary body below. The fundus could not be properly seen, and the tension is given as 40 mm. W. H. Crisp.

Scobee, R. G. Rubeosis iridis diabetica. Texas State Jour. Med., 1944, v. 40, Dec., p. 432.

A case of rubeosis iridis diabetica is reported, with successful surgical result in the secondary glaucoma associated with the rubeosis. Cyclodiathermy was the procedure used. The possible etiology of rubeosis of the iris is discussed, and also possible reasons for the success of the cyclodiathermy.

Theodore M. Shapira.

Sverdlick, José. Phenomena of secretory activities in the epithelium of the ciliary processes. Reprint from Arch. de Histologia Normal y Patologica (Buenos Aires), 1944, v. 2, July, pp. 248-265.

The experimental material was de-

rived from man and from the dog and rabbit. It was possible to demonstrate in the cells corresponding to the superficial layer of the ciliary processes a granular substance, the character of which differs from the mitochondria and from the lipid vesicles described by various authors, but possesses characteristics corresponding to secretory granules. By the location of the granules in the part of the cell bathed in aqueous humor, it is deduced that the cells are related to the process of formation of this fluid. (8 figures, references.)

W. H. Crisp.

## 8

### GLAUCOMA AND OCULAR TENSION

Gözcü, N. I. Pathogenesis and treatment of the glaucoma syndrome, and results of peripheral iridectomy. *Göz Klinigi*, 1944, v. 2, no. 1, p. 1.

The author believes like Magitot that glaucoma is mainly due to disturbance of the uveal circulation, the cause of which is a sympathicotonia in the eye. He thinks sympathetic ganglia in the eye are destroyed by peripheral iridectomy, with the result that the local sympathicotonia is cured. Three successful peripheral iridectomies in glaucoma are discussed.

Joseph Igersheimer.

Kronfeld, P. C. Gonioscopic correlates of responsiveness to miotics. *Arch. of Ophth.*, 1944, v. 32, Dec., pp. 447-455; also *Trans. Sec. on Ophth.*, Amer. Med. Assoc., 1944, 94th mtg.

Angle-block glaucoma, wide-angle glaucoma, glaucoma secondary to iridocyclitis, glaucoma after cataract operation, and glaucoma associated with capsular exfoliation are discussed in some detail, with particular refer-

ence to gonioscopic findings as correlated with responsiveness to miotics. In angle-block glaucoma it is probable that miotics favorably affect the glaucoma largely through their miotic action. Gonioscopic studies have shown that in this type the smallest sector of open angle that is compatible with normal intraocular pressure is 70 to 90 degrees of arc.

Glaucoma caused by peripheral anterior synechias resulting from delayed restoration of the anterior chamber after cataract operation is discussed. Three variations of the anterior edge of the adhesions are found; namely a solid, sharply demarcated line; a fuzzy, scalloped zone, and multiple thready, filamentous adhesions. The first type gives rise to the more serious cases of glaucoma. Most cases of glaucoma following cataract extraction respond in some degree to miotics. In eyes with senile capsular exfoliation, irrespective of whether or not glaucoma is present, the gonioscope shows particles of exfoliated capsular material deposited on both walls and in the vertex of the angle, in addition to pronounced pigment infiltration of the trabecula. In cases of so-called primary glaucoma not of the iris-block type and of glaucoma secondary to iridocyclitis, there is no apparent relation between the gonioscopic picture and the efficacy of miotics.

John C. Long.

## 9

### CRYSTALLINE LENS

Hughes, W. L., Guy, L. P., and Ro-main, H. H. Use of absorbable sutures in cataract surgery. *Arch. of Ophth.*, 1944, v. 32, Nov., pp. 362-367.

After trying the different kinds of absorbable and nonabsorbable sutures,

the authors come to the conclusion that absorbable suture material for use in cataract operations is more desirable than a material that must be removed, since complications incident to removal of the sutures are avoided. The nearest approach to the ideal suture, holding seven to ten days, colored for ease in identification, economical in price, easy to handle, and well tolerated by tissues is 00000 plain surgical gut. But this suture is less flexible than silk, and the authors do not feel that it fulfills all the requirements for an ideal suture. (3 figures.) R. W. Danielson.

Samuels, Bernard. Complicated cataract associated with spontaneous detachment of the retina. *Arch. of Ophth.*, 1944, v. 32, Nov., pp. 416-422; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42.

In three recent papers the author has discussed and illustrated the pathologic changes in the lens in perforating ulcer of the cornea, in leucoma adherens, and in spontaneous iritis, respectively. The purpose of the present studies has been to ascertain the changes which may occur in a lens as a result of various pathologic conditions in the globe. The cataract that is associated with retinal detachment often has a peculiar yellowish-white hue.

The material consisted of microscopic preparations of lenses from 21 globes. There were 11 specimens which were associated with a history or anatomic signs of myopia. Only cases of spontaneous detachment were chosen, those being excluded in which the condition was caused by tumor, exudative retinitis, angiomas of the retina, or by retinitis interna and externa. A majority of the 21 globes were removed because of development of the well-

known triad that may follow sooner or later in the wake of the detached retina; namely, iritis, secondary glaucoma, and cataract. A globe with an old detachment or one with a potential detachment is intolerant to ever so slight a blow.

In all probability, in many cases iritis should not be considered a complication of the retinal detachment but should rather be regarded as a sequel of a hidden inflammatory process that antedated the detachment and was in fact the original cause of it. Occasionally a detachment causes a complicated cataract without any sign of inflammation either clinical or pathologic in the anterior part of the globe. Causes other than the detachment that were believed to have contributed to development of the cataract were iritis, altered metabolism, and glaucoma.

The cause of inflammation of the iris associated with retinal detachment has never been clearly explained. However, that the iritis is produced by toxins in the stagnant subretinal fluid seems to be proved by the fact that after puncturing the sclera and allowing the fluid to escape, as advocated by Meller of Vienna, the iritis more often than not quiets down. A factor in altered metabolism considered to have exerted an unfavorable influence on the lens was interference with the outflow of intraocular fluid into the papilla. Then, too, a disturbance of the general metabolism of the body may set up inflammation in a diseased globe whereas it may have no effect on a sound eye.

The author discusses associated changes in the retina, subretinal fluid, choroid, vitreous, ciliary body, and iris. There was no evidence that the choroid was the source of the subretinal fluid, particularly since the pigment epi-



thelium was never raised. Specimens from 17 globes permitted examination of the vitreous anterior to the retina. In five cases the vitreous was detached and in five others it was traversed by membranes. In three cases it contained blood. A "step" in the retina at the point of a detachment of the vitreous is an anatomic sign of traction. This observation seems to substantiate the theory that most retinal detachments result from traction by bands of broken-down vitreous. The iris was often severely irritated, the ciliary body seldom. Clinically, iris bombé in a globe that is known to have been blind for a long time may well be regarded as a sign of retinal detachment.

Exhaustive microscopic studies of the lenses were made. When this series of lenses was compared with the three previous series as to the extent of the changes and their frequency and distribution, the following characteristics of cataract associated with spontaneous retinal detachment were apparent: (1) the presence of well-defined vesicular cells in the posterior quadrant of the lens: these cells were observed to occur in far greater abundance and frequency than in the other series; (2) the lining of the entire capsule by a single layer of epithelial cells in greater abundance than previously noted.

The author concludes that the presence of epithelial cells in the posterior quadrant of the lens, where normally there are no cells, implies that they had proliferated in that direction in response either to a chemical agent or to an inherent impulse to grow backward. (8 figures, references.)

R. W. Danielson.

Thomas, C. I. Suction instrument for cataract extraction. *Amer. Jour.*

*Ophth.*, 1945, v. 28, March, p. 317. (One figure.)

Verhoeff, F. H. Removal of the ruptured capsule in operations for cataract. *Arch. of Ophth.*, 1944, v. 32, Nov., pp. 407-409; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42.

In the so-called intracapsular operation for cataract, the capsule sometimes ruptures. If the broken capsule recedes into the eye, the extraction usually becomes extracapsular. When rupture does occur, it is due to one or more of the following causes: (1) Imperfect technique: the incision is too small for the cataract; or, more often, the operator through impatience exerts too great traction with the forceps or too little pressure with the expressor. (2) The forceps is poorly adjusted and tends to bite a hole in the capsule. (3) The patient is a "bad actor," making a wide-movement of the eye at a critical time.

There are two types of rupture of the capsule that are really fortunate occurrences, for each not only insures complete removal of the capsule but as concerns loss of vitreous makes the operation safer than when the cataract is removed without rupture of the capsule. In the first of these types, the capsule ruptures below and is completely removed by the forceps, the cataract being left within the eye. The nucleus should then be expressed with great care, and the sutures should be pulled up before the remaining lens material is irrigated out. In the second type, the capsule ruptures elsewhere but remains prolapsed in the wound after the nucleus has been expressed. Such a capsule can easily be picked up with forceps and completely removed.

The author has devised a simple pro-

cedure to apply to this situation. The procedure consists essentially in keeping the anterior chamber filled while the capsule is grasped and removed with the angular capsule forceps. After one suture has been tied the opening of the wound is so much reduced in size that the chamber can easily be kept sufficiently distended by gentle, continuous irrigation with isotonic solution of sodium chloride. For the irrigation a small metal tip attached to a rubber bulb is used. Occasionally the author has carried out the irrigation with his right hand while he removed the capsule with a forceps held in his left. He prefers, however, that a capable assistant carry out the irrigation so he can give his entire attention to removing the capsule. (References.) R. W. Danielson.

## 10

## RETINA AND VITREOUS

Agatston, S. A. Relation of blood dyscrasia to retinopathy. *Arch. of Ophth.*, 1944, v. 32, Nov., pp. 388-390.

All types of retinopathy are based on localized structural changes in the blood vessels and capillaries, irrespective of the cause. Since nutrition of the walls of small vessels and capillaries depends on the quality as well as the quantity of the blood within, qualitative or quantitative reduction results in degenerative changes.

The following blood dyscrasias may be responsible for ophthalmic manifestations: chlorosis, pernicious anemia and sprue, Jaksch anemia (anemia infantum pseudoleukemica), secondary anemia, sickle-cell anemia, aplastic anemia, hyperplastic anemia, erythremia (polycythemia vera), secondary polycythemia, purpura hemorrhagica,

hemophilia, scurvy, lipemia, leukemia, sepsis, and diabetes. The author gives briefly the fundus picture of each of these diseases. (References.)

R. W. Danielson.

Ballantyne, A. J. Observations on the pathology of thrombosis of the central vein of the retina. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 137-142.

The author presents the pathologic findings in the case of circinate retinopathy reported by Loewenstein and Garrow (see below). The central vein was traced with difficulty as it was obliterated by an organized thrombus or by sclerosis, but there were open venous channels situated more peripherally in the nerve. Forward the central vein came into view as a single vessel, or as two, three, or four channels formed either by canalization of an old thrombus or by formation of new venous channels. The case seems to prove that it is possible to have thrombosis of the central vein without hemorrhage. Two changes were taking place: gradual localized occlusion of the vein and equally gradual formation of collateral channels. (7 illustrations.)

Beulah Cushman.

Ballantyne, A. J., and Loewenstein, A. The pathology of diabetic retinopathy. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 95-115.

This histologic report is based on examination of nine specimens, the posterior half of the eyeball being used in eight and the whole eyeball in one. The endothelial cells were found sprinkled with fatty droplets of varying size and density, sometimes arranged as a belt around the lumen. In other places, where the fatty infiltration of the endo-

thelium was of notable degree, the wall of the vessel had become ectatic, forming an aneurysm. Clinically the aneurysmal changes appeared as globular bodies attached to the vessels in series, like strings of beads, or as isolated spherical bodies consisting of closely packed red blood corpuscles enclosed within a capsule. If unconnected with a vessel these bodies are called encysted hemorrhages. They were identified as the small round spots found around the macula and described clinically as punctate hemorrhages.

Groups of fatty droplets were found 7 to 10 microns under the retinal surface and 40 to 50 microns deeper were found larger droplets. In the advanced cases retinal degeneration was extensive, with preretinal vessels embedded in a deep layer of primitive connective tissue which covered the surface of the retina, and which the authors call retinal pannus. Phlebosclerosis was seen in two forms: a nonsymmetrical fibrillary thickening of the vein wall with normal lumen, and a great thickening with complete hyalinization and narrowing of the lumen. (15 illustrations, references.) Beulah Cushman.

Knapp, Arnold. **Spontaneous retinal reattachment.** *Arch. of Ophth.*, 1944, v. 32, Nov., pp. 403-406; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42.

The course of serous retinal detachment is sometimes curiously modified when the detachment of the retina remains stationary and there is reattachment which gives rise to a characteristic ophthalmoscopic picture. The detachment is shallow, and its upper boundary is bound down by chorio-retinal changes, which constitute the most striking sign. The reattached, flat retina is generally changed to a

paler, yellow gray; there are characteristic branching white subretinal lines and areas where the choroidal markings are more distinct and irregular retinal pigmentation is present. The upper boundary consists of organized exudate, which extends across the fundus below the disc in a curved or in a more or less straight line to the periphery on each side and divides the fundus into two dissimilar parts.

The present accepted explanation of the cause of retinal detachment assumes the presence of degenerative changes in the retina and in the vitreous body, with the formation of an adhesion between these two structures, this adhesion resulting in a tear of the retina due to rotatory movements of the vitreous body. This does not explain the causation of the detachment in the cases observed and described by the author. In these 16 cases the detachments occurred in young people, in whom degenerative changes are not frequent. Also, in the case of a dialysis the cause is entirely physical. Moreover, the adhesion of the vitreous to the underlying retina in the periphery of the eyeground is normally unusually strong, so that a pathologic process which binds the vitreous and the retina together need not be present. It is possible that the firmer texture of the vitreous body at its base explains why escape of the vitreous fluid in this type of detachment is moderate. Finally, an important factor in the shallowness of a detachment limited to the lower half of the eyeground may be the weight of the vitreous body, which acts most on the lower half of the fundus.

Notwithstanding the prospect of self-limitation of a retinal detachment which is limited to the lower half of the fundus, the author advises early

operation to avoid involvement of the macula and to preserve the visual field. (References, 2 drawings.)

R. W. Danielson.

Laird, R. G. Iodide therapy for senile macular degeneration. *Amer. Jour. Ophth.*, 1945, v. 28, March, pp. 287-296; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42. (One table, references.)

Loewenstein, A., and Garrow, A. A contribution to the anatomy of circinate retinopathy. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 120-135.

The authors give the histopathology of circinate retinopathy in the fifth case to be described since Jonathan Hutchison first mentioned the condition in 1876. E. Fuchs described it in 1893.

The eye was fixed in formol, sectioned in front of the equator, and studied at the slitlamp after removal of the vitreous body. The piece of retina containing the circinate changes was excised, cleared in glycerin, and examined microscopically, unstained and in bulk. The nerve-fiber pattern was clearly visible except in the circinate area. The discrete white shining dots sheathed vessels in several places, and with higher power the spots were resolved into rows of discrete reflecting droplets of different size, surrounding the clearly visible thickened vessel walls.

The piece of retina was then washed out and stained in bulk. With scarlet red the arcuate area appeared shining red. The higher power revealed that the sheathing of the larger vessel consisted of fat. Parts of the circinate area were embedded in gelatin, sectioned vertically, and counterstained with a thin solution of hematoxylin. The con-

trast of the nuclei with the red fatty droplets was very impressive. Two absolutely different foreign substances were found: fatty droplets mostly in round red patches situated throughout the whole retinal thickness, and a non-fatty substance in large spaces corresponding to the internuclear layer.

The vascular changes were at different levels. The capillaries varied from 3 to 15 microns in width and were dilated locally to form aneurysmal ectasias with different degrees of fatty-wall change. In some walls there was leakage, with exit of red blood corpuscles. Perfect chains of aneurysms emphasized the degree of vascular damage. Fatty changes were present in the central part of the intraretinal hemorrhages, and new blood vessels were seen. Most of the endothelial cells contained one or more fatty droplets. Apparently empty spaces in the outer granular layer corresponded to exudates. A gelatinous tissue covered the greater part of the retinal surface, and contained red blood cells and some vessels. The choroidal vessels were found to be normal. Their stroma contained fatty droplets.

The causal genesis may differ in different cases, and the authors conclude that circinate retinopathy is not an etiologic clinical entity but a form of cellular reaction in the retina. (15 illustrations, references.)

Beulah Cushman.

Samuels, Bernard. Complicated cataract associated with spontaneous detachment of the retina. *Arch. of Ophth.*, 1944, v. 32, Nov., pp. 416-422; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42. See Section 9, Crystalline lens.)

Shukla, K. N. Evolution of the modern surgical treatment of retinal de-

tachment. *Indian Jour. Ophth.*, 1944, v. 5, July, pp. 55-59.

A general discussion of the subject, with reproductions of some illustrations from Arruga and from Cole Marshall.

Sverdllick, J. Influence of the hypophysis and the suprarenal gland upon retinal pigment in "*Bufo arenarum*" Hensel. Reprint of paper presented to Sociedad Argentina de Biología, June 11, 1942. (See Section 19, Anatomy, embryology, and comparative ophthalmology.)

Wolff, Eugene. Ghost-rings on the internal limiting membrane of the retina. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 116-119.

The author identifies the rings often seen on the internal limiting membrane of the retina in histopathology as the product of disintegrated mononuclear cells. He feels that they represent one stage in disappearance from the vitreous cavity of those mononuclear cells derived from the ciliary body or retina. Probably the cell becomes swollen and the nucleus passes through the cell membrane leaving a ghost-ring, while later the nuclear contents pass out of the nuclear membrane leaving the smaller ghost-ring and finally the rings break down into granules. (4 illustrations.)

Beulah Cushman.

## 11

### OPTIC NERVE AND TOXIC AMBLYOPIAS

Basar, Irfan. Optic atrophy after intestinal hemorrhage. *Göz Klinigi*, 1944, v. 2, no. 1, p. 7.

A 39-year-old patient suffered from duodenal ulcers for twelve years. After hematemesis lasting several days he

lost the vision of his left eye. Some weeks later this eye showed atrophic disc, constriction of the visual field, and central scotoma. The patient could count fingers at 3 feet.

Joseph Igersheimer.

Cohen, Martin. Binocular papilledema in a case of torulosis associated with Hodgkin's disease. *Arch. of Ophth.*, 1944, v. 32, Dec., pp. 477-479.

Torula, a pathogenic yeastlike organism, may cause disturbances in the central nervous system, often with fundus lesions. It is noteworthy that in at least 10 percent of the reported cases the torulosis was associated with Hodgkin's disease. This is too frequent an occurrence to be a mere coincidence, but so far the relationship of the two diseases has not been established.

The author reports the case of a 36-year-old woman who was first seen because of visual deterioration of two months standing. She complained of severe headaches, accompanied by drowsiness and intermittent vomiting. The cervical lymph glands were enlarged. Both fundi showed papilledema, hemorrhages and exudates. The cerebrospinal fluid pressure was greatly increased, and torula histolytica could be cultured from the fluid. This organism was also found in cultures of the urine. Administration of sulfadiazine had no marked effect. Ventricular drainage was done for a week with some visual improvement. The patient developed a superimposed intracranial infection with nonhemolytic streptococci. The discs remained edematous and became grayish, the vision being completely lost. The patient's condition grew progressively more serious, with nuchal rigidity, opisthotonos and tremors of the upper extremities. He

died in coma. At autopsy, findings typical of Hodgkin's disease were found in the thoracic, abdominal, and cervical nodes. Torulas were demonstrated in the brain tissue, as well as in the secretions covering the cortex of the cerebrum and pons. Pericellular infiltration of the pia-arachnoid of the optic nerve was observed. (One color plate, including 5 figures; references.)

John C. Long.

Cox, R. A. Amblyopia resulting from hemorrhage. *Arch. of Ophth.*, 1944, v. 32, Nov., pp. 368-371.

Occasionally after profuse distant hemorrhage there is noticed immediately, or more frequently after the lapse of days, a sudden diminution of vision, which often goes on to complete and permanent blindness, with the ophthalmoscopic picture of atrophy of the optic nerves. Deprivation of blood supply to any tissue will, if sufficiently prolonged, cause impairment or loss of function. If there is any correlation between delicacy of structure and of function, one may expect that those structures which are concerned with the most delicate functions will be earlier and more readily affected. Thus the retina will suffer before more coarsely constituted organs.

The resulting blindness is usually bilateral, and may be permanent or transitory. It usually comes on between the third and the seventh day after bleeding but may be delayed for some time. Recovery is possible even after light perception has been abolished for several days, provided the pupillary reaction to light is retained. In patients with a more favorable prognosis the amblyopia lasts from a few minutes to many hours. (One case report, fields, references.)

R. W. Danielson.

Flecker, H. Sudden blindness after eating "finger cherries" (*Rhodomyrtus macrocarpa*). *Med. Jour. Australia*, 1944, v. 2, Aug. 19, p. 183.

As early as 1894 reports indicated that eating of the fruit of *Rhodomyrtus macrocarpa* or finger cherry, a plant indigenous to north Queensland, could cause sudden and usually permanent blindness. Since not all who have eaten the fruit have been so afflicted the cases were reviewed as to ripeness of the fruit at the time of eating, and as to the possibility that a fungus, *Gloeosporium periculosum*, which commonly infests the overripe fruit, might be the causative agent. Seven cases in humans are briefly described, and cases in which blindness ensued in heifer calves and a goat after browsing on the fruit and foliage are recorded. Little is known about the clinical picture in the early stages. The late picture is usually one of primary optic atrophy with sluggish or inactive pupils. Some patients have retained light perception and hand movements in one or both eyes. In 1915 the Department of Education prepared a bulletin for distribution to the local schools of North Queensland, giving pictures of the plant and fruit with a discussion of its dangers. No cases have been reported during the subsequent years. The toxic factor has never been positively identified.

Owen C. Dickson.

## 12

### VISUAL TRACTS AND CENTERS

Figueiredo, N. P. de. Ocular symptoms of hysteria. *Rev. Brasileira de Oft.*, 1944, v. 3, Dec., pp. 74-93.

Imaginary blindness appeared due to emotional disturbance. The treatment consisted of an alleged operation, which was repeated several times.

Without anesthesia, on each occasion the eyeballs were grasped with forceps and moved in several directions. A weak solution of zinc sulphate was instilled and the eyes bandaged. The vision steadily improved, to reach normal in about a week. The author devotes a further 15 pages to a review of various ocular symptoms arising from hysteria. (References.) W. H. Crisp.

Oberndorf, C. P. Ocular symptoms of psychogenic origin. *Arch. of Ophth.*, 1944, v. 32, Dec., pp. 443-446.

A mechanism known to the psychiatrist as "displacement" consists in the moving of genital "affects" from a primary object or function to a secondary one. When displaced associations become attached with sufficient tenacity to the secondary object, the latter may assume the functions of the first and may eventually become a welcome substitute for the primary one in fulfilling certain emotional needs of the organism. Substitutions springing from the unconscious as a result of persistent and constant repression of unacceptable "instinctual" urges often come to light. These urges, particularly the sexual ones, may continue when relief and satisfaction are normal. When they are suppressed but not relinquished, the denial of expression gives rise to complaints referred to various bodily systems. Such substitutions may take the form of physical complaints ascribed to many different organs. The ocular complaint may be "eyestrain," pain, blurring of vision, or even blindness.

The relationship of the eye to various neuroses is shown and clinical examples are given. Practical applications of the treatment of ocular neuroses are discussed. Often it is not

advisable to tell the patient at once of the psychogenic nature of his ailment. The clinical psychotherapist must confine himself to presentation of such facts as seen valid in accordance with his method. The soundness of his work rests largely on recognition of the validity of such facts by the patient, and on disappearance of the symptoms when the inhibitions which necessitated conversion phenomena no longer operate.

John C. Long.

### 13

#### EYEBALL AND ORBIT

Adler, F. H. The role of exophthalmos in the diagnosis and treatment of Graves's disease. *West Virginia Med. Jour.*, 1944, v. 40, Oct., p. 136.

The earliest sign in the thyrotoxic type of Graves's disease is lid retraction. The cause of lid retraction is unknown. It gives rise to the other lid signs in Graves's disease, such as lid-lag and infrequent winking, and is the cause of the characteristic facial expression of thyrotoxicosis. Lid retraction causes a slight degree of exophthalmos, but simulates a much greater degree. It is not pathognomonic of Graves's disease.

Exophthalmos can be diagnosed only by actual measurement, and even then one can only assert the degree of protrusion of the globe is pathologic when (1) the condition is unilateral and the difference between the two eyes exceeds 1.5 mm. and (2) previous measurements have shown the increase to have occurred when the condition was bilateral. Two types of exophthalmos occur in Graves's disease. One type is due to the same mechanism as causes the lid retraction, hence is of slight degree, occurs in the cases which are thyrotoxic, and disappears when the

lid retraction disappears. No pathology is found in the orbit to account for this type. The other type is due to edema of the orbit, followed by cellular infiltration. It is progressive, especially in hypothyroid individuals, remains or gets worse even though the thyrotoxicosis is cured, and persists after death.

The signs by which this type of ophthalmopathic Graves's disease can be recognized are outlined as follows: (1) edema of the lids, noninflammatory; (2) edema of the bulbar conjunctiva, settling to the lower cul-de-sac, but not involving the palpebral conjunctiva; (3) progressive exophthalmos; (4) early limitation of movement of one or both globes due to proptosis: there is little diplopia since limitations are usually bilateral and in the same direction; (5) exophthalmos out of all proportion to signs of thyrotoxicosis; in fact, strikingly in the inverse proportion; hence most frequently seen in post-thyroidectomy cases. Ten case reports are presented, and the medical treatment outlined.

Theodore M. Shapira.

Gonçalves, Paiva. Orbital varix (intermittent exophthalmos). *Rev. Brasileira de Oft.*, 1944, v. 3, Dec., pp. 57-63.

The patient, a young man, experienced severe pains in the left eyeball upon lowering his head or in ventral decubitus. Upon repeating the necessary maneuver, the eyeball protruded behind distended and congested eyelids. It took one or two minutes for the condition to quiet down, and by this time the pain was of such intensity that if anyone undertook to hold the patient with his head down he made violent efforts to release himself. Enophthalmos was manifest between the crises. The vision was equal to that

of the other eye. The author proposed to try the effect of roentgen rays, and if these proved ineffective to resort to sclerosing injections. (4 photographs.)

W. H. Crisp.

Murphey, P. J., and Schlossberg, L. Eye replacement by acrylic maxillo-facial prosthesis. *U. S. Naval Med. Bull.*, 1944, v. 43, Dec., p. 1085.

A detailed description of the method of manufacture of artificial eyes as used by the Naval Dental School at the National Naval Medical center, Bethesda, Maryland, is given. Heretofore much was usually left to be desired in the fitting of prostheses both as to good cosmetic result and as to restoration of normal facial contours. Following study of the usual posterior socket wall and of the functions of the various extraocular muscles it was found that an adequate prosthesis should have a superior fullness to support the upper lid, a posterior concavity to accommodate the rectus muscles, and occasionally an increased inferior lip to prevent ejection of the prosthesis on upward gaze and also to enable the orbicularis to assist in elevation.

Details of the procedure include preliminary study of the patient, including photography to outline the problem, on through the making of a mold of the socket by use of one of the alginate gels, down to the production of an acrylic resin blank to represent the sclera. An artist draws a reproduction of the fellow iris on paper, which is then accurately placed in a bed prepared in the sclera. Finally clear fluorescent acrylic polymer is prepared and is molded over the iris to represent the cornea. The final prosthesis is then polished, vessels painted on the sclera, and the prosthesis tried on the patient. Any



necessary small modifications can be made by grinding and polishing.

The acrylic material used is only slightly susceptible to etching by the eye-socket fluids or secretions. If scratched from handling, it may easily be polished. The prothesis is resistant to the usual accidental stresses, and, if a clean break occurs, can be repolymerized or the entire eye duplicated. Pictures of end results are given as well as descriptions of the various steps in the process. Owen C. Dickson.

Romagosa, J., and Rackley, G. D. **Orbital cellulitis with severe cerebral symptoms.** *New Orleans Med. and Surg. Jour.*, 1944, v. 97, Dec., p. 276.

This is the report of a case of severe orbital cellulitis possibly complicated by cavernous-sinus thrombosis. Although the prognosis at the outset seemed very grave, complete recovery followed therapy with sulfonamide drugs, penicillin, and later drainage of a supraorbital abscess. It is certain that this patient had severe orbital cellulitis with beginning extension backward into the cranial cavity and with possible thrombosis of the cavernous sinus. It is almost certain that without chemotherapy death would have occurred before localization of the infection and abscess formation could take place. It is difficult to evaluate the relative roles played by the sulfonamide drugs and penicillin in this case, since they were administered concomitantly. It should be noted, however, that marked improvement occurred after intravenous administration of sulfathiazole and before penicillin could be obtained.

Theodore M. Shapira.

Ruedemann, A. D. **Eye changes in disease of the thyroid.** *Jour. Lancet*, 1944, v. 64, Nov., p. 376.

The author presents a review of over

10,000 cases of thyroid disease. The fact that it may be only part of a polyglandular difficulty is stressed. Overaction of the thyroid, toxic thyroid, or hyperthyroidism is the only disturbance producing exophthalmos of a high degree. Colloid goiter and hypothyroidism, except when the basal metabolism is very low, affect to a lesser degree. Persistently wide palpebral fissures should make one suspicious of hyperthyroidism in either children or adults. Neurocirculatory asthenia must be ruled out by the result of bed rest, by rapidly falling basal rate, and so on. If the exophthalmos is bilateral or progressive, surgery to the thyroid is indicated. The duration of the exophthalmos prognosticates the amount of recession later, averaging about 2 mm. (Hertel). Muscle errors are common and persistent, and may require exercise or surgery. Corneal ulceration is infrequent and is due to exposure or some neuromuscular factor. Exophthalmos of hypothyroidism is bilateral and is associated with edema of the upper and lower lids.

Owen C. Dickson.

Stephenson, W. V. **Anterior megalophthalmos and arachnodactyly.** *Amer. Jour. Ophth.*, 1945, v. 28, March, pp. 315-317. (References.)

## 15

### TUMORS

Bruner, W. E. **Errors in diagnosis of intraocular tumors.** *Amer. Jour. Ophth.*, 1945, v. 28, March, pp. 297-302; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42.

Goldsmith, A. J. B. **The effect of diathermy on a malignant melanoma of the choroid.** *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 88-94.

The author gives the histologic findings of the sarcomatous eye whose treatment with diathermy is reported by Williamson-Noble (see below under that name), and which was removed because of a large intraocular hemorrhage 27 days after the diathermy. A great part of the tumor was a necrotic mass. There was an area of active growth posteriorly and anteriorly. There were no blood vessels in the operative area. From the choroid in front of the tumor new capillary loops and fibroblasts were growing into the necrotic tumor mass. Two of the posterior ciliary vessels were thrombosed. The necrosis appeared recent and the author felt it was due to the diathermy and to loss of nutrition from thrombosis of the vessels.

The author concludes that complete destruction of a suitably placed choroidal growth of small size could be secured by diathermy coagulation, and that surface diathermy might be the safest method because of its avoiding dissemination. As many of the pigmented malignant tumors of neuroepithelial origin are radio-resistant, and large doses of radon, radium, or X rays would be necessary for effective treatment and damage to lens or retina might therefore result, he feels that diathermy, being almost entirely local in its effect on the blood vessels, is the method of choice once it has been decided not to enucleate the eye. (2 figures, references.) Beulah Cushman.

Williamson-Noble, F. A. The effect of diathermy on a malignant melanoma of the choroid. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 85-86.

The author reports treatment of a sarcoma of the choroid with diathermy, in an eye without increased tension in

a woman 44 years of age. Three days later a large hemorrhage occurred. As vision did not improve, the eye was enucleated 27 days after the diathermy operation. (And see under Goldsmith above.) Beulah Cushman.

## 16

## INJURIES

Heppel, L. A., Neal, P. A., Endicott, K. M., and Porterfield, V. T. Toxicology of dichloroethane. *Arch. of Ophth.*, 1944, v. 32, Nov., pp. 391-394.

This paper is concerned only with the peculiar action on the cornea of certain species of animals upon exposure to dichloroethane vapor in different concentrations. Eleven species of animals were used and four concentrations were employed; 3,000, 1,500, 1,000 and 400 parts per million parts of air. Each period of exposure was seven hours.

Exposure of dogs for seven hours to inhalation of dichloroethane in concentrations of 400, 1000 and 1500 parts per million led to bilateral swelling and turbidity of the corneas. Development of the turbidity was always bilateral, but the clearing process sometimes involved only one eye. When dogs were given repeated daily exposures to dichloroethane in a concentration of 1000 parts per million in series of five exposures and separated by rest periods of two days, they gradually became tolerant to the vapor. Eventually, no cloudiness developed after the exposures. Of eleven species of animals tested for sensitivity of the cornea to dichloroethane, namely, the rat, mouse, rabbit, guinea pig, hog, cat, raccoon, fox, dog, chicken and rhesus monkey, only the fox and the dog showed cloudy corneas. No cases of injury to the human cornea from dichloroethane

have been reported. (References, 2 figures.)  
R. W. Danielson.

Hessberg, R. J. Problems of ophthalmology of modern warfare. *Vida Nueva*, 1944, v. 18, Oct., pp. 149-218.

This exhaustive article deals with the subject under many headings, some of which are as follows: physical capacity of the soldier and the problem of compensation for injuries caused by war; requirements for entering military service; emergency treatment; perforating lesions; the obligation of the soldier to submit to operation; gas gangrene; tetanus infection; sympathetic ophthalmia; fractures of the orbit; contusion of the posterior part of the eye and detachment of the retina; head injuries; lesions in the interior of the orbit; radiography for demonstration of bullets in the cranium; lesions of the brain; importance of campimetry; traumatic retinopathy; gas injuries; burns and blasting injuries; surgery of reconstruction; care and reëducation of war blind. (No illustrations, no list of references.)

W. H. Crisp.

King, E. F. Some observations in traumatic cataract. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 43, pp. 76-83.

Operative interference should not be undertaken until the reaction to the original trauma has subsided. Preliminary treatment should be conservative. The sulfonamides should be used early with any suggestion of an exogenous infection, and protein shock therapy should be repeated if necessary until five doses have been given at three-day intervals. Secondary glaucoma can usually be controlled with mydriatics and heat in the form of short-wave diathermy.

The treatment of traumatic cataract

under optimum conditions depends somewhat on the condition of the second eye. The operation is technically easier if done within a few months or weeks of the original injury.

Operative interference is contraindicated if vitreous is in the anterior or posterior chamber, if there are anterior synechiae or thickened anterior capsule, and in patients past middle age unless intracapsular extraction is practicable. (One figure.)

Beulah Cushman.

McGuire, W. P., and Raffetto, E. C. Construction of a contact lens for localization of intraocular foreign bodies. *U. S. Naval Med. Bull.*, 1944, v. 43, Dec., p. 1239.

A method of manufacturing a contact lens, using materials at hand in a dental prosthetic department, is described. A matrix of pink dental base-plate wax is molded to fit inside the lids of a standard patient. The matrix serves both as a lid retractor and as a form for holding the impression material, which consists of an alginate base-powder type which when mixed with water forms an elastic gel. The retarder of a unit of this type is first placed in 75 c.c. of water at 70 degrees F. and dissolved. The powder is then added and spatulated, and the mass is applied to the anesthetized eye. The setting time is four minutes. The resulting impression is accurate and should show a definite corneoscleral junction. The impression is then fixed, a stone cast poured, a wax pattern made and a clear acrylic resin lens processed. This is polished and placed in the eye and the vertical and horizontal meridia marked with pencil at the corneoscleral margin. Silver amalgam alloy is packed into small holes drilled into the anterior surface of the

lens at the above points. The lens is then polished and is ready for use.

The technique of use is the same as that described by Pfeiffer after the original description by Comberg. This is briefly given in the article. Their exposure factors are current strength of 30 milliamperes at a distance of 30 inches and an exposure of  $\frac{3}{4}$  second. The anteroposterior view is taken at 75 kv. and the lateral at 58 kv. All views are taken with a 60-cycle current and full-wave rectification. (Drawings of lens.)

Owen C. Dickson.

Scherling, S. S., and Blondis, R. R. Effect of chemical-warfare agents on the human eye. *Arch. of Ophth.*, 1944, v. 32, Nov., pp. 381-387.

With the possibility of gas warfare, it becomes apparent that clinical investigation of chemical agents so employed and their effects on the human eye is of paramount importance. The material for this study consisted of personnel at a chemical-warfare arsenal. The authors report in detail representative cases of (1) injury from mustard gas vapor, (2) injury from liquid mustard gas, (3) injury from lewisite vapor, (4) injury from lewisite, (5) injury from thermate and (6) injury from white phosphorus lime.

From their study, the authors draw the following conclusions: Photophobia and blepharospasm are constant complaints. The bulbar conjunctiva appears to suffer more than does the tarsal conjunctiva. Staining of the corneal epithelium after exposure to mustard gas is rapid and punctate, indicating a keratoconjunctivitis rather than a conjunctivitis only. Mustard-gas vapor produces rather characteristic edema of the corneal epithelium, the appearance being greasy and the

process reversible. Absence of exudate and cells in the aqueous and of changes in the iris suggests that the products of corneal breakdown are not toxic if absorbed into the aqueous and that mustard gas does not pass unchanged through the cornea. Despite the fact that lewisite liquid and lewisite vapor have been proved to be as destructive to the skin as is mustard gas in corresponding form and dosage, the reported cases of contamination of the eyes show little serious effect. In none of these cases was there evidence of increased intraocular pressure.

The authors make the following recommendations: Homatropine is preferable to atropine since the corneal damage is transient and reversible. Casualties from vesicant agents need exist as such for only two days to two weeks, and the casualty time and the duration of symptoms and signs correspond to the clinical severity of the burn.

Use of glycerine, because of its hygroscopic effect, is recommended to combat the corneal edema that accompanies keratoconjunctivitis due to mustard-gas vapor. Contamination of the conjunctiva with particles of white phosphorus should be treated as elsewhere on the body surface, the medication including immediate use of a copper-sulfate solution. (2 tables, 2 photographs, references.)

R. W. Danielson.

Snell, A. C., Jr. Perforating ocular injuries. *Amer. Jour. Ophth.*, 1945, v. 28, March, pp. 263-281. (16 tables.)

Unsworth, A. C. Cordite as an intraocular foreign body. *Arch. of Ophth.*, 1944, v. 32, Nov., pp. 414-415.

Probably cordite has been introduced into the eyes in many wounds

due to explosions, but the entrance of the powder has been overshadowed by extensive damage or by the presence of other foreign material. The author presents two cases in detail. He concludes that cordite as an intraocular foreign body is in itself relatively innocuous, and that conservative treatment should be employed. References.

R. W. Danielson.

# 17

## SYSTEMIC DISEASES AND PARASITES

Carroll, F. D. The role of dental infection in diseases of the eye. Connecticut State Dental Assoc. Bull., 1944, Dec. 11, pp. 37-41.

The author considers which diseases of the eye may be almost certainly caused by dental infection, which may probably be caused by this factor, and which are definitely not due to it. In the first class he includes uveitis, episcleritis, and orbital inflammation; in the second class certain cases of blepharoconjunctivitis, keratitis, and macular disease; and among those never or almost never related to dental infection he places retrobulbar neuritis, senile cataract, and primary glaucoma. In slowly tracing down the etiology of one eye disease after another, the role of foci of infection has diminished. A sense of balance is essential in the evaluation of this medical problem. On the other hand, although dental infection is now considered an infrequent cause of eye disease, it may in any particular case be of great importance. (References.)

W. H. Crisp.

Hogan, M. J., and Cordes, F. C. Lipo-chondrodystrophy. Arch. of Ophth., 1944, v. 32, Oct., pp. 287-295.

Lypochondrodystrophy is a rare con-

genital disease characterized by chondrodystrophic changes in the skeleton and deposition of a lipid-like substance in many of the tissues, including the cornea. The disease is first noticed about the first year of life, when dorso-lumbar kyphosis and enlargement of the head become apparent. By the age of four years normal growth has largely ceased. The head is enlarged, and deformed by saddle nose, wide-set protuberant eyes, and thickening of lips and tongue. The abdomen is protuberant, with an umbilical hernia and enlargement of the liver and spleen. The joints of the extremities present deformities and limitation of motion. In over 75 percent of cases a distinct cloudiness of the corneas appears before the age of three years. The corneas have a ground-glass appearance and are diffusely hazy. The haze is produced by tiny gray or yellow-gray dots which eventually become distributed throughout the stroma.

The authors report the pathologic findings of three cases of this disease examined at autopsy. Two of the patients were brothers whose clinical findings had been reported previously. One of the children died at the age of 6½ years of pulmonary tuberculosis, one of a respiratory infection at the age of five and one of hydrocephalus at the age of five years. Detailed studies of the corneas were made to determine the cause of the haze. The corneal changes were found to be limited to the region of Bowman's membrane and to the corneal corpuscles. There was an infiltration of numerous large phagocytic cells into the region of Bowman's membrane, with thinning and rupture of the membrane. The corneal corpuscles were swollen. Both the phagocytic cells and the corneal corpuscles showed

numerous fine granules in their cytoplasm. These granules could be seen in frozen sections but could not be found in tissues prepared in fat solvents, an indication of their possible lipid nature. The granules, however, did not take the usual stains for fats. The findings of the authors closely correspond to those of two of the three other observers who have reported histologic examinations of eyes in lipochondrodystrophy. (7 illustrations, references.)

John C. Long.

Isola, W., and Osimani, J. J. A new case of conjunctival ophthalmomiasis produced by *Oestrus ovis* in Uruguay. Arch. Uruguayos de Med., Cirugia y Especialidades, 1944, v. 25, Sépt., pp. 260-264.

The only case previously published in Uruguay was reported in 1925 by Gaminara. The present case was in a youth of 18 years, who gave the history that three days previously, while taking his siesta in the shade of a tree, he had been pestered persistently by an unusually large fly, which in spite of all his efforts succeeded in striking his right eye. He had no immediate discomfort, but the next day had a definite sensation of a foreign body in the right eye, with which was associated mild irritation of the conjunctiva.

The patient discovered the presence of a small "worm" which wriggled vigorously in the conjunctival sac; he removed it easily. In the course of the same day he was able to extract four new "worms." Two days later medical examination disclosed the presence of two more larvae, each about 1 mm. long, one adherent to the tarsal conjunctiva and the other to the upper bulbar conjunctiva. Microscopic study

indicated that the larvae were of the species *Oestrus ovis* L. The authors confirm the opinion of Gailliard that the monograph by the Russian author Portchinsky is erroneous in showing "thorns" on the abdominal instead of the dorsal surface of the larvae. Special attention is called to the characteristic tenacity of *Oestrus ovis* in making its deposit of eggs; such characteristic having been noted in previously reported cases. (References.) W. H. Crisp.

Rudolph, C. J. Eye findings in rheumatic fever. Amer. Jour. Ophth., 1945, v. 28, March, pp. 319-321. (References.)

## 18

### HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Anson, B. J. Conceptions of structure, function, and diseases of the eye in the collected works of Ambrose Paré. Quarterly Bull. Northwestern Univ. Med. School, 1944, v. 18, no. 3, pp. 244-255.

Organs were considered hollow tubes or pulpy masses. A bodily organ was said to be able to exert a normal action when the vaporous spirit or pneuma was strong and pure, and was assisted by a proportionate mixture of four essential juices, termed humors. If the spirit became weak or the humors degraded either by the direct effect of heat or cold, or by deleterious aerial particles, the organs were diseased. The doctor cleared the organs of humoral wastes by blood-letting, and strengthened the spirit by dietary means.

The eyes were said to be composed of six muscles, five coats, three humors, and "a most bright spirit"; furthermore, of two nerves, a double vein, and one artery. The visual spirit enclosed

in the eye was described as transmitting a physical image of the environmental scene through the humors along the canalized optic nerve to the ventricular headquarters of the spirit. In the ventricles the spirit was stored and refined, and sent or received by way of the hollow nerves. (2 figures.)

R. Grunfeld.

Biram, J. H., and Barton, P. N. Vision and accident repeaters. *Indust. Med.*, 1944, v. 13, Sept., p. 683.

Two control groups and one accident-repeater group totalling 280 employees were studied, using the American Optical Company's industrial visual testing device with vectograph target. Lack of binocular vision was found in 10 percent of the accident-repeater group, and in 3.3 percent of control groups 1 and 2. Distant depth perception was below normal in 46.6 percent of the accident repeaters. On applying these percentages to preplacement candidates one would lose 4.4 good candidates for each accident repeater eliminated, an increase in rejection rates of 26.5 percent of all preplacement candidates.

A similar study of the horizontal phorias revealed that 15 out of every 100 accident repeaters would be eliminated, with a loss of 42 nonaccident-repeaters. This would increase the rejection rate percentage 8.1 percent.

Although there is some correlation between certain visual defects and the accident-prone worker, these factors alone do not justify rejection of a worker for a hazardous job. It is suggested that with the above there should be combined dexterity tests and other psychologic tests, although these alone have not proved too successful in determining job placement.

Owen C. Dickson.

Carr, E. F. Bibliography of early ophthalmological works in the Archibald Church Library. *Quarterly Bull. Northwestern Univ. Med. School*, 1944, v. 18, no. 3, pp. 238-243.

The author enumerates and comments upon the rare books on ophthalmic subjects, 32 in number, to be found in the Archibald Church Library. Three of the rare books were printed in the 16th, 5 in the 17th, and the rest in the 18th century. (10 illustrations.)

R. Grunfeld.

Chance, Burton. Johannes Müller. *Arch. of Ophth.*, 1944, v. 32, Nov., pp. 395-402.

Johannes Müller, a German doctor of the 19th century, is chiefly notable in the field of ophthalmology for his observations on the mechanism of sight. His principal contributions were his explanations of color sensations caused by pressures on the globe, "pressure phosphenes"; of the adaptation of the eyes for sight at different distances; of single vision with two eyes; of the cause of single vision; and of phenomena of double vision.

Of greatest value was Müller's comprehension of binocular vision. He observed that in normal eyes the movements of the eyes would always cause the images to fall directly on corresponding parts of the two retinas, producing single vision. If, on the contrary, from various causes the images fell on noncorresponding points, double vision resulted. Müller assumed that single vision was effected by the passage of similar fibers from these points to the brain, which became united and gave rise to the consciousness of a single object.

Müller, in spite of his greatness, did not make any discovery in ophthalmology.

mology of the highest rank, but he did investigate and turn to the best account what others had discovered. (One reference, 9 figures.)

R.-W. Danielson.

Gover, M., and Yaukey, J. B. Defective vision as determined by the Snellen test, and other chronic conditions. Public Health Reports, 1944, v. 59, Sept. 8, pp. 1171-1184.

The Farm Security Administration organized clinics for examination of members of white and Negro borrower families residing in 11 Southern States and six Northern or intermediate States. These families represent a low-income farm population and the researches were made in connection with a rehabilitation program. Curves of age prevalence of defective vision as determined by the Snellen test are presented. These show less defective vision than urban groups, especially between the ages of 20 and 45 years. Defective vision is less frequent among Negroes than whites for both male and female groups in practically every locality. White females have more defective vision than white males, and among the Negroes the same proportion is noted, for every age group. The incidence of pterygium is higher among white males. Negroes have higher rates than whites for cataract, whites have higher rates for strabismus and trachoma. Outstanding are the high prevalence of cataract in Florida and of trachoma or suspected trachoma in Arkansas. (References.)

M. Lombardo.

Hillman, C. C. The Army rehabilitation program for the blind and deafened. Arch. Physical Therapy, 1944, v. 25, Aug., p. 478. (See Amer. Jour. Ophth., 1944, v. 27, Nov., p. 1332.)

Knapp, A. A. Eyeglasses for combat. U. S. Naval Med. Bull., 1944, v. 43, Nov., p. 964. (See Section 3, Physiologic optics, refraction, and color vision.)

Koch, F. L. P. Patron saints of the eyes: an outline. Amer. Jour. Ophth., 1945, v. 28, Feb., pp. 160-172. (10 figures.) Also Trans. Amer. Ophth. Soc., 1943, v. 41, p. 490. (16 figures.)

Mann, W. A. Contributions of Sanford R. Gifford to the literature. Quarterly Bull. Northwestern Med. School, 1944, v. 18, no. 3, pp. 215-223.

Gifford wrote two text books, the Textbook of Ophthalmology and the Handbook of Ocular Therapeutics, and about 150 scientific articles. Although a few of the articles were mere reviews, all of them were especially instructive, easily readable, and thought-provoking. (List of publications of Gifford.)

R. Grunfeld.

Post, L. T., and Slaughter, H. C. National ophthalmological societies in the United States. Ophth. Ibero Amer., 1944, v. 6, no. 1, pp. 26-29 (in English), and pp. 30-34 (in Portuguese). (See Amer. Jour. Ophth., 1944, v. 27, p. 1225.)

Puntenney, I., and Spear, D. Some practical procedures employed by Dr. Sanford R. Gifford. Quarterly Bull. Northwestern Med. School, 1944, v. 18, no. 3, p. 223-231.

A few of the contributions made by Sanford Gifford to the teaching and practice of ophthalmology are enumerated by the authors as they saw them applied in everyday practice. (2 figures.)

R. Grunfeld.

Riemer, H. B. Topographic and etiologic study of 1,176 indigent blind



persons in Massachusetts. *Arch. of Ophth.*, 1944, v. 32, Oct., pp. 304-307.

In the past it has been very difficult to obtain any indication of either the number of blind persons or the causes of blindness in a community. The Federal Social Security Board, in extending aid to the states for care of the indigent blind, has insisted that blind applicants be examined by competent ophthalmologists and that records be kept of the defects found. This has made it possible to obtain reliable statistics on the causes of blindness among the indigent.

The author reviews the findings in 1,176 cases of blindness in the state of Massachusetts. The data are summarized in three tables giving the topography and type of disease, an etiologic classification, and the age at onset of blindness. Glaucoma, with 111 cases, headed the list of diseases involving the eyeball, and myopia was second with 100 cases. There were 38 cases of blindness due to structural anomalies of the globe. Corneal disease was responsible for 187 cases and diseases of the iris and ciliary body for 100. There were 18 cases of sympathetic ophthalmia. Lens abnormalities were responsible for 181 cases. Involvement of the choroid and retina caused blindness in 217 cases, of which there were 60 of chorioretinitis, 59 of retinal degeneration, 37 of retinal hemorrhage, 29 of arteriosclerotic disease, and 25 of separated retina. In 205 cases blindness was caused by disease involving the optic nerve and visual pathway.

Infectious diseases produced blindness in 376 cases, of which syphilis was responsible for 128. Trauma, including chemical burns, accounted for 61 cases. In 13 cases blindness was due to poisoning and in 18 to neoplasm. Gen-

eral diseases were responsible for 93 cases, of which diabetes produced blindness in 45 and vascular disease in 40. In 152 cases blindness was due to conditions of prenatal origin, including 141 cases of retinitis pigmentosa.

Statistical studies of the causes of blindness form the basis of any real program of prevention. The present study emphasizes the following needs: Enforcement of all laws enacted for the control of infectious disease; more care in reporting causes of blindness; early detection of glaucoma and diabetes; prevention of injuries; authentic data on cases in which blindness is hereditary; adequate measures to assure proper medical care so as to prevent onset of blindness. (3 tables, references.)

John C. Long.

Unsworth, A. C. A discussion of ocular malingering in the armed services. *Amer. Jour. Ophth.*, 1945, v. 28, Feb., pp. 148-159. (References.)

## 19

### ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Stone, L. S. Functional polarization in retinal development and its reestablishment in regenerating retinæ of rotated grafted eyes. *Proc. Soc. Exper. Biol. and Med.*, 1944, v. 57, Oct., p. 13.

Because of the regenerating faculty of adult salamander eyes after interruption of either nerve supply or blood supply, or after total transplantation, interesting experimental work on orientation of spatial localization is possible. Rotation of an eye through 180 degrees without interruption of the nerve or blood supply totally reversed the direction of motor activity resulting from visual stimuli, indicating definite quadrantic localization of visual and tectorial stimuli. Restora-

tion of the eye to normal position restored the usual visuomotor responses.

Rotation of an eye 180 degrees after excision, in which regeneration of the retina was necessary before vision returned, revealed the same reversal of quadrantic localization as in simple rotation without excision. Experiments are under way on larval and embryonic stages to determine the time at which retinal spatial differentiation is established. So far rotation of the cup in embryos results in no alteration in normal orientation.

Owen C. Dickson.

Sverdlitch, J. Influence of the hypophysis and the suprarenal gland upon retinal pigment in "*Bufo arenarum*" Hensel. Reprint of paper presented to Sociedad Argentina de Biologica, June 11, 1942.

The author describes a series of experiments upon these frogs. After ligation of some of the principal arteries, Ringer's fluid is carried into the circulation, replacing the blood stream. When the Ringer solution is clear, Held's fixation fluid is introduced, so as to fix the organs and tissues of the cephalic region. The method was applied to 54 animals, and 108 eyes were studied histologically. Some frogs were used as controls, some after removal of the hypophysis, some after removal of the suprarenals.

It was found that the retinal pigment in this frog expanded in light and retracted in darkness. After removal of the hypophysis, illumination produced moderate retraction, although less than in the control animal exposed to darkness. After injection of extract of the posterior lobe of the hypophysis, illumination caused complete expansion of the pigment in the hypophysectomized animal, but there was no effect

in darkness. The suprarenal gland did not appear to have any physiologic effect on the reactions to light and darkness. Adrenalin expanded the pigment after exposure to either light or darkness.

W. H. Crisp.

Vidal, F., and Ma'brán, J. L. Arrangement of the myelinic fibers in the optic tract of the cat. Arch de Oft.-de Buenos Aires, 1942, v. 17, Dec., p. 733.

In 24 cats of different ages, retinal microlesions were produced and one or both eyes enucleated after a period of time ranging from nine days to ten months. The specimens were studied with the Weil and Marchi technique as modified by Zwank-Davenport. On the basis of this experimental work it is concluded that the degenerated primary fibers of the optic tract end or lose their identity in the zone of the ventral geniculate body. Enucleation of one eye showed the number of crossed fibers to be greater than the number of homolateral fibers. Osmium tetroxide stain showed the optic fibers to be arranged in two bundles: (a) the larger bundle, occupying the lateral portion; (b) the smaller bundle, occupying the medial border. The homolateral fibers run along the external border of the tract. The retinal microlesions produced by catholysis and studied with the osmium-tetroxide stain show that the inferior homolateral fibers run along the external border of the tract, while the superior homolateral fibers are situated toward the medial border. (Photomicrographs, bibliography.)

Plinio Montalván.

Warkany, J., and Schraffenberger, E. Congenital malformations of the eyes induced in rats by maternal vitamin-A deficiency. Proc. Soc. Exper. Biol. and Med., 1944, v. 57, Oct., p. 49.

The occurrence of anophthalmos and microphthalmos in pigs whose mothers had been fed a diet deficient in vitamin A has been demonstrated. The authors have developed what they term "open eyes" in three still-born litters of experimental rats which had been fed diets deficient in vitamin A. Nine of the other mothers in the series resorbed their embryos, the three previously mentioned being the only ones to carry their litters toward term.

In the abnormal "open eye" there is *no clear differentiation of lids and cornea*, and the anterior chamber is present in a rudimentary form only. In the normal eye the vitreous can be seen between the lens and the retina, where-

as the same space in the abnormal eye is filled with connective tissue. The retina of the abnormal eye is folded and disorganized. In the closed abnormal eye the lids are fused with the cornea, and the anterior chamber appears as a linear space between the thick membrane thus formed and the lens. In several specimens a cleft can be seen in the inferior part of the retina, and a strand of connective tissue penetrates this cleft and spreads out in the space between the lens and the retina. *This cleft represents a coloboma of the retina.* No such abnormality was present in control series. (Microscopic pictures shown.)

Owen C. Dickson.

## NEWS ITEMS

Edited by DR. DONALD J. LYLE  
904 Carew Tower, Cincinnati 2

News items should reach the editor by the twelfth of the month

### DEATHS

Dr. William A. Ackroyd, Binghamton, New York, died February 9, 1945, aged 58 years.

Dr. Henry R. Boettcher, Chicago, Illinois, died February 8, 1945, aged 78 years.

Dr. Wallace R. Briggs, Sacramento, California, died December 18, 1944, aged 50 years.

Dr. George A. Crafton, Fulton, Kentucky, died December 17, 1944, aged 56 years.

Dr. William M. Edmonds, Tonawanda, New York, died January 11, 1945, aged 54 years.

Dr. John A. Flury, Saint Louis, Missouri, died January 9, 1945, aged 58 years.

Dr. Elmer F. Fuqua, Atlanta, Georgia, died January 6, 1945, aged 64 years.

Dr. John H. Garey, Berlin, Pennsylvania, died November 9, 1944, aged 93 years.

Dr. Peter A. Helgesen, Lake Mills, Iowa, died January 19, 1945, aged 76 years.

Dr. Herbert J. Hopkins, Pittsburgh, Pennsylvania, died December 14, 1944, aged 77 years.

Dr. Charles E. Magoun, Sioux City, Iowa, died December 18, 1944, aged 56 years.

Dr. Benjamin H. Mann, Philadelphia, Pennsylvania, died November 22, 1944, aged 58 years.

Dr. John C. O'Gwynn, Mobile, Alabama, died January 13, 1945, aged 65 years.

Dr. Terigi R. Paganelli, New York, New York, died February 18, 1945, aged 63 years.

Dr. Harry C. Parker, Gulfport, Florida, died January 11, 1945, aged 67 years.

Dr. Charles E. Walker, Jr., Denver, Colorado, died November 22, 1944, aged 41 years.

Dr. Emil H. Webster, Sault Sainte Marie, Michigan, died January 19, 1945, aged 75 years.

### MISCELLANEOUS

The American Board of Ophthalmology will hold an examination at Los Angeles in January, 1946, at the time of the Mid-Winter Course.

Applications for this examination must be filed before September 1st.

For details prospective candidates should write at once to Dr. S. Judd Beach, Secretary, Cape Cottage, Maine.

Formation of The Eye Bank for Sight Restoration, Inc., which will collect and preserve healthy corneal tissues from human eyes for transplanting to blind persons who have lost their sight because of corneal defects, was recently announced. The organization, national in scope, has been incorporated under the laws of New York State, and 22 leading hospitals in

New York City are now affiliated with it. In addition, 20 outstanding ophthalmologists throughout the country will serve in an advisory capacity. Headquarters are at 210 East 64th Street, New York City.

The officers are Stanley Resor, president; Dr. R. Townley Paton, vice-president; Cyril B. Hartman, secretary; Walter C. Baker, treasurer; and Mrs. Henry Breckinridge, executive director.

It has been announced by the National Society for the Prevention of Blindness that Dr. Willis S. Knighton, New York, will serve as chairman of the Committee on Glaucoma of the National Society for the Prevention of Blindness, succeeding the late Dr. Mark J. Schoenberg. Additions to the Committee on Glaucoma include Major Fred Heffinger, superintendent, and Dr. F. L. P. Koch, chief of the Glaucoma Clinic, Manhattan Eye, Ear, and Throat Hospital, New York City.

The sixth annual William Thornwall Davis Postgraduate Course in ocular surgery, pathology, ocular motility, and orthoptics will be given at the George Washington University School of Medicine, Washington, D.C., May 28-June 2, 1945. The Army Institute of Pathology, directed by Col. J. E. Ash, MC, A.U.S., will give the course in eye pathology as has been done in former years. The surgery, ocular motility, and orthoptics will be given by the resident staff of the Department of Ophthalmology under the direction of Dr. Ernest Sheppard, Professor of Ophthalmology. The course is limited to 30 registrants.

The program for the coming meeting of the Pan-American Congress of Ophthalmology, which is to be held in Montevideo, Uruguay, the week of November 25, 1945, is practically completed, and will be published in the very near future. As was done at the last Congress, all papers will be in Spanish, Portuguese, or English, with projected translations as the paper is being presented.

Any recognized ophthalmologist is eligible for membership. The annual fee is \$5.00, payable to Dr. Conrad Berens, Treasurer, 218 Second Avenue, New York 3, New York. That fee entitles the member to receive gratis the official organ of the Congress, "Ophthalmologia Ibero Americana," which is a quarterly trilingual abstract journal.

Tentative travel arrangements are being made with the Pan-American Airways, as well as the American Express Company, but these cannot be concluded definitely until there has been a further turn in world affairs.

The fourteenth semi-annual postgraduate conference in neuromuscular anomalies of the eyes was held at the Children's Memorial Hospital at Chicago, Illinois, by George P. Guibor, M.D., from May 6th to 11th, inclusive. Among the guest lecturers were Drs. Hendrie W. Grant, Aubrey Pember, and Avery Prangen.

The John O. McReynolds Lectureship was inaugurated April 6th by Dr. James W. White of New York who spoke on "Treatment and prevention of neuromuscular eye defects." This lecture was established at the University of Texas Medical Branch, Galveston, by Col. and Mrs. Frank W. Wozencraft, who were among the honor guests.

#### SOCIETIES

The forty-second meeting of the Reading Eye, Ear, Nose, and Throat Society was held in Philadelphia, Wednesday, February 21, 1945. The Eye Section attended medical and surgical clinics and a lecture by Dr. Wilfred E. Fry, at Wills Hospital.

The Brooklyn Ophthalmological Society held its regular meeting on April 19th at the Towers Hotel. The following scientific program was presented: "Hypertension and retinal vascular disease" by Dr. William Dock, discussed by Dr. Edwin P. Maynard with re-

gard to medical aspects and Dr. John N. Evans with reference to ophthalmologic aspects; and "A clinical study of the effect of tobacco inhalation on the normal angioscotoma" by Dr. Austin I. Fink.

At the March 27th meeting of the Milwaukee Oto-Ophthalmic Society Dr. Peter C. Kronfeld of Chicago spoke on "Causes of failure of anti-glaucomatous operations."

The Los Angeles Society of Ophthalmology and Otolaryngology appointed the following officers for 1945: Dr. Orrie E. Ghrist, president; Dr. Alfred R. Robbins, vice-president; and Dr. K. C. Brandenburg, secretary-treasurer. Meetings take place at the Los Angeles County Medical Association Building, 1925 Wilshire Boulevard, Los Angeles, on the fourth Monday of each month from September to May, inclusive.

The Association for Research in Ophthalmology has canceled its 1945 meeting in cooperation with the war-travel and convention program. Essayists are requested to reserve their manuscripts for a possible meeting in 1946, in conjunction with the convention of the American Medical Association.—Brittain F. Payne, Lt. Colonel (MC), Secretary-Treasurer, AAF School of Aviation Medicine, Randolph Field, Texas.

The annual Congress of the Ophthalmological Society of Egypt was held at the Memorial Ophthalmic Laboratory, Giza, Egypt, on March 15th and 16th. Included in the program was a symposium on "Proptosis."

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## SYMPATHETIC OPHTHALMIA FOLLOWING SUBCONJUNCTIVAL RUPTURE OF THE EYEBALL\*

CHARLES A. PERERA, M.D.

*New York*

Sympathetic ophthalmia has been recognized for at least 250 years. Randolph,<sup>1</sup> in an excellent historical review, showed that the disease was known in the latter part of the seventeenth century by Thomas Bartholinus, and later by Bidloo, Le Dran, Beer, and Demours. The last-named was the first physician in France who called attention to this malady and undoubtedly recognized it as early as 1818. Hirschberg<sup>2</sup> recorded that von Ammon, in his prize essay on iritis, in 1835, described two cases of sympathetic inflammation following injury and warned oculists to watch for this disease in cases of traumatic iritis of one eye. Mackenzie described sympathetic ophthalmia exhaustively in his textbook in 1844.

Sympathetic ophthalmia is a serious disease of the eyes, and fortunately very rare. Duke-Elder<sup>3</sup> estimated that it occurs in about 0.1 to 0.15 percent of clinic patients, and in about 90 percent of the instances follows perforating wounds of the eyeball or intraocular operations. A survey of the literature by R. Irvine,<sup>4</sup> in 1940, showed that sympathetic ophthalmia followed perforating wounds of the globe in 1 or 2 percent of the cases. Sta-

tistics on the incidence of sympathetic ophthalmia recorded by many authors show that 25 to 40 percent of the examples are associated with operations upon the eyeball. The disease occurs at all ages, and is found predominantly in males. Sympathetic ophthalmia has been described in cases of necrotic malignant melanoma of the uveal tract, following perforating ulcers of the cornea, and as an aftermath of contusion of the eyeball with subconjunctival rupture of the globe. Most of the few examples of sympathetic ophthalmia following contusion without rupture of the eyeball are open to doubt. The case of Delaney,<sup>5</sup> reported in 1931 as an instance of sympathetic ophthalmia unassociated with perforation or rupture of the eyeball, cannot be considered as correctly diagnosed, since the pathologic report by Major George Callender of the Army Medical Museum showed no evidence of the microscopic findings typical of sympathetic ophthalmia. In spite of the pathologist's report, the author concluded that this case was one of sympathetic ophthalmia because all medical investigations were negative. Lamb,<sup>6</sup> in 1932, reported an example of typical sympathetic ophthalmia in a six-year-old girl following nonperforating trauma. Joy,<sup>7</sup> in his analysis of 41 cases of sympathetic ophthalmia in 1935, included two instances in children following airgun injuries, the injured eyes pre-

\*From the Department of Ophthalmology, College of Physicians and Surgeons, Columbia University, and the Institute of Ophthalmology, Presbyterian Hospital, New York. Candidate's thesis for membership in the American Ophthalmological Society, June, 1944.



senting hyphema and no rupture of the globe. Trowbridge<sup>8</sup> recorded in 1937 a case of sympathetic ophthalmia as following a superficial injury by a piece of wood. Andersson,<sup>9</sup> in 1938, reported such a case in a child, only to find a tiny perforating wound of the sclera, choroid, and retina in a study of serial microscopic sections of the enucleated globe. Complete studies of sympathetic ophthalmia within the past 40 years have been made by E. Fuchs,<sup>10</sup> Gilbert,<sup>11</sup> Theobald,<sup>12</sup> Joy,<sup>7</sup> Woods,<sup>13</sup> D. H. Trowbridge,<sup>8</sup> Gördüren and Sohr,<sup>14</sup> and R. Irvine.<sup>4</sup>

The etiology of sympathetic ophthalmia is still unknown, but two main theories are favored: (1) ectogenous infection, and (2) allergy, probably to uveal pigment. Tuberculosis as a cause is becoming less tenable. Holst,<sup>15</sup> in 1941, reported five examples of sympathetic ophthalmia in healthy children following penetrating injuries of the eyeball. Since all these youngsters gave a negative response to intradermal tuberculin tests, the author concluded that these cases could not have been caused by the tubercle bacillus. H. Gifford<sup>16</sup> and A. Fuchs<sup>17</sup> were among the proponents of the theory of ectogenous infection by microbes or virus. Elschnig<sup>18</sup> introduced in 1910 the conception that sympathetic ophthalmia is due to antigenic resorption of uveal tissue from injury or disease, thence to the hypersensitivity of the remaining portion of the uvea of the primarily diseased eye which were not influenced by the trauma, and primary inflammation as well as hypersensitivity of the normal uvea of the second eye. This theory was supported by Elschnig's co-workers, Salus<sup>19</sup> and Bail,<sup>20</sup> and in the excellent papers of J. S. Friedenwald<sup>21</sup> and Woods.<sup>13, 22</sup> Gill<sup>23</sup> reported his findings to be consistent with the uveal-pigment-sensitivity theory.

The pathologic description of sympathetic ophthalmia was revealed by the classic studies of E. Fuchs.<sup>10</sup> At the present time, pathologists recognize a characteristic histopathologic appearance in sympathetic ophthalmia, and differentiate this from the findings in ocular tuberculosis and other types of chronic uveitis. The main features in sympathetic ophthalmia in examinations of microscopic sections of the involved eyeballs are small round-cell and epithelioid-cell infiltration of the uveal tract, giant cells in the infiltrated areas, and varying amounts of pigment phagocytosis by the epithelioid cells. There is often a considerable infiltration in the region of the injury or operation. Eosinophils and plasma cells may compose a part of the infiltrate. A plastic exudate is frequently present. The iris is rarely if ever involved alone. Its posterior layers are first infiltrated with lymphocytes and later with epithelioid cells. The ciliary body shows involvement mainly in the vascular layer. The choroid usually reveals early infiltration in the layer of large blood vessels. The choriocapillaris is the least-involved layer of the choroid. The pigment epithelium often discloses excrescences made up of epithelioidlike proliferations, known as Dalen-Fuchs nodules. The remainder of the retina is not a further participant in the inflammatory process except for round-cell infiltration of the walls of the blood vessels in some cases. The sclera often contains lymphocytes in the lamina fusca and in the emissaria. Weigelin<sup>24</sup> confirmed Fuchs's findings and added descriptions of 17 cases from the Tübingen University Eye Clinic. Samuels<sup>25, 26, 27</sup> further clarified the microscopic picture of sympathetic ophthalmia and showed that the characteristic infiltration in this disease develops in three stages: (1) lymphocytic infiltration in and around the walls of the large veins of the choroid,

(2) the formation of typical nodules containing giant cells in the center, surrounded by epithelioid cells and lymphocytes, and (3) the stage of formation of tumor-shaped masses of granulation tissue composed of the aforementioned cells.

The diagnosis of sympathetic ophthalmia is made in view of the history and clinical course of the specific plastic uveitis, in conjunction with the characteristic pathologic picture on study of sections of the enucleated eye. Without a pathologic examination, the identification of sympathetic ophthalmia may be correct, but is not proved and must be considered as presumptive. It is possible to have proved sympathetic ophthalmia, from a histologic point of view, in an injured eye or one operated on, with no evidence of uveitis in the uninjured eye. Trowbridge<sup>8</sup> found two examples in his series.

Schirmer,<sup>28</sup> in his classic study of sympathetic ophthalmia in 1892, emphasized the need for critical study of the cases reported in the literature. He found that many examples diagnosed as sympathetic ophthalmia were improperly classified. Of 21 records of sympathetic ophthalmia following subconjunctival rupture of the globe, only 6 could be considered as valid instances, and 2 of these could be questioned.

This study was prompted by my investigations of a patient with sympathetic ophthalmia following a subconjunctival rupture of the eyeball. I have reviewed the available literature dealing with this rare combination and have listed the reported cases. It seemed logical and reasonable to exclude instances in which a surgical procedure had been carried out subsequent to the injury and preceding the onset of specific inflammation of the uninjured or sympathizing eye. I have also rejected examples of sympathetic ophthalmia following rupture of the sclera in which the lens, iris, or both of

these structures have been lost, as well as those cases in which the conjunctiva has been visibly torn. A few reports in the literature, such as those of Mooren,<sup>29</sup> Seidel,<sup>30</sup> and Rønne (quoted by Jensen<sup>31</sup>) give details which are inadequate for a well-grounded diagnosis. Joy,<sup>7</sup> in his series, included a case of subconjunctival rupture of the globe with a mild sympathetic ophthalmia five weeks after the injury, but the data given were too scanty to warrant inclusion in the list below.

#### CASE REPORTS FROM THE LITERATURE

The following group of cases are presumptive or proved cases of sympathetic ophthalmia following subconjunctival rupture of the eyeball which have been reported.

##### *1. Reported by Jacob<sup>32</sup> in 1874.*

A farmer was accidentally struck in the right eye by the finger of a person who was accosting him. The vision of the injured eye was immediately blurred. The left eye became inflamed seven weeks later, resulting eventually in a blind left eye, with adherent pupil, tremulous iris, and cataract. The author's examination of the patient's right eye at a later date showed the lens dislocated beneath the bulbar conjunctiva above and nasally, no trace of iris, a retina which was in good condition, and useful vision with the aid of a convex lens.

##### *2. Reported by Ayres<sup>33</sup> in 1876.*

A man, aged 38 years, ran against a pump handle, striking his right eye. The vision of this eye was immediately reduced to light perception. The vision of his left eye began to fail six weeks later, with pain in both eyes. Examination of the right eye showed an indirect rupture of the sclera, extending around the globe nasally. There was bluish-black hemorrhagic material beneath the bulbar con-

junctiva nasally, and the lens was seen as a rounded elevation under the conjunctiva anterior to the caruncle. The anterior chamber was deep. A small segment of iris was seen inferiorly. The media were turbid. Vision was equal only to detect hand movements. The left eye showed a dense pseudomembrane in the pupil, a shallow anterior chamber, complete posterior synechia, ciliary injection. The patient was hospitalized. Atropine was instilled into each eye three or four times a day. The vision of the injured eye improved to 15/40 by four months after the accident. The intraocular pressure of the left eye increased, with iris bombé and increased congestion. Iridectomy was performed on the left eye, with normalization of the intraocular pressure and disappearance of the ciliary injection. The vision of the left eye was practically nil.

### 3. Reported by Ayres<sup>34</sup> in 1882.

The patient was a man, aged 50 years, whose left eye was struck by the handle of a shovel or his own thumb. This eye sustained a subconjunctival rupture of the sclera, the wound being half an inch long, irregular, and directed upward. The anterior chamber was filled with blood. The vision of his right eye began to fail five weeks after the injury, and sympathetic iridocyclitis of the right eye was diagnosed. The patient was hospitalized for 2½ weeks and treated with atropine instillations and hot poultices. Examination 2½ months after the injury showed the vision of the left eye to suffice only for counting fingers at 3 feet. A grayish mass was seen in the vitreous. The vision of the right eye was 20/100. The right eye revealed moderate dilatation of the pupil, a posterior synechia downward and inward, and edema of the nerve head. One month later, the vision of the right eye had improved to 20/30. The condition

of the right eye gradually ameliorated until its vision became normal. The left eye finally cleared, with vision equal to counting fingers at 14 feet with a +9.00D. sph., absence of the iris, and a reduction in the size of the vitreous coagulum.

### 4. Reported by Gunn<sup>35</sup> in 1887.

A man, aged 58 years, had the left eyeball ruptured by a cow's horn. The lens was dislocated beneath the conjunctiva in the upper inner ciliary region. The right eye became injected and its vision misty six weeks after the injury. There were posterior synechiae of the right eye. The left eye was enucleated. Vision of the right eye was 20/50, 11 months after the injury. Pathologic study of the left eye showed: lens in its capsule beneath thickened conjunctiva in the upper nasal ciliary region; iridodialysis opposite the site of the scleral rupture, which was closed with tissue not unlike the thickened conjunctiva over the lens; a small hyphema; a deep anterior chamber; and generalized thickening of the ciliary body and choroid.

### 5. Reported by Deutschmann<sup>36</sup> in 1889.

The patient was a woman, aged 40 years, whose right eye suffered a subconjunctival rupture of the globe from an injury by a cow's horn. The sight of the injured eye was lost immediately. Examination of the right eye revealed a subconjunctival rupture of the sclera superiorly, with iris prolapse beneath the conjunctiva and bloody exudate in the anterior chamber. The left eye became inflamed four weeks after the injury, and the vision of this eye became impaired one week later. Enucleation of the right eye was performed six weeks after the injury. At that time the left eye had vision of 20/200 and showed ciliary injection and fine posterior synechia. There was

little change in the left eye two months later.

6. *Reported by Sachs<sup>37</sup> in 1889.*

The patient, 48 years of age, suffered a scleral rupture of the left eye in the ciliary region, with subconjunctival dislocation of the lens and iris nasally, and incarceration of the ciliary body in the scleral wound. The subconjunctival elevation measured 8 by 3 mm. The right eye became inflamed seven weeks after the injury, and was found to have iritis. The left eyeball was removed 8½ weeks after the accident, and the iritis of the right eye subsided three weeks later.

7. *Reported by Knapp<sup>38</sup> in 1891.*

The left eye of a man, aged 45 years, was bumped by the head of a small pet dog. Examination of this eye 10 days later showed subconjunctival hemorrhages, an elevation beneath the nasal bulbar conjunctiva produced by a dislocated iris, intact conjunctival and corneal surfaces, a 3- to 4-mm. rupture of the sclera nasally, iris absent from the interior of the eye, lens in place, some blood in the lower vitreous, and visual acuity of 15/200. The right eye had always been weak, and its vision was 20/70 with a convex lens. The right eye became inflamed 25 days after the injury, with reduction of visual acuity. A progressive plastic uveitis of the right eye developed, with remissions and relapses, finally leaving vision of 1/200 and a pupil closed by a dense gray pseudomembrane. The vision of the injured left eye was 2/200 seven months after the accident.

8. *Reported by Wadsworth (in discussion of Knapp's case) in 1891.*

A boy, aged 12 years, suffered a subconjunctival rupture of the sclera in the ciliary region from an injury by a spitball

projected from a toy gun. The uninjured eye became inflamed about three weeks after the accident. The injured eye was removed four weeks after the injury, but the sympathetic uveitis progressed to loss of vision of the patient's remaining eye.

9. *Reported by Meyer<sup>39</sup> in 1896.*

The patient was a woman aged 43 years, whose right eye was injured by a cow's horn. This eye was painful and inflamed, but quieted after several weeks, only to flare up again 10 months later. At this time, the left eye became painful, and the patient suffered from headache around this eye, and pain on attempting to read. Examination, 11 months after the injury, showed a shrunken right eye, with a scleral scar nasally, ciliary injection, an atrophic greenish-yellow iris, pupillary posterior ring synechia, and organized vascularized exudate in the lower pupil and in the posterior chamber. The left eye disclosed punctate deposits on the posterior cornea and on the anterior lens capsule, no posterior synechia, and a clear vitreous. Complete physical examination of the patient was negative. The right eye was immediately enucleated; rapid clearing of the intraocular inflammation of the left eye ensued and restoration of its vision to 6/6. Pathologic study of the right eye revealed infiltration beneath intact conjunctiva over a scleral wound in which iris was incarcerated, shallow anterior chamber, exudate extending from scleral wound to posterior chamber, hematogenous pigment and necrotic tissue under the conjunctiva and in the scleral rupture, young granulation tissue with some giant cells on the anterior lens capsule, infiltration of the ciliary body with dispersal of its pigment, thickening of the choroid, and detached retina. Coccuslike bodies were seen between the corneoscleral margins of the wound. This

globe showed a combined plastic and purulent iridocyclitis and choroiditis, indicative of a chronic and a recent inflammatory process.

*10. Reported by Donaldson<sup>40</sup> in 1897.*

A woman, aged 33 years, struck her right eye against the latch of a door. Examination of the injured eye showed a soft globe, a bluish swelling under the intact bulbar conjunctiva superiorly, blood in the anterior chamber, and vision of light perception. The left eye was normal. The right eye became painful, and there was bulging of the scleral wound. Enucleation was done 20 days after the accident. The microscopic study of the right eye disclosed a plastic cyclitis. The uninjured left eye became inflamed 47 days after the accident and 27 days after the removal of the injured right globe. The left eye had deposits on the anterior lens capsule. Physical examination of the patient gave normal findings. The woman was followed for five years during which her left eye suffered from recurring attacks of uveitis, worse after a bout of "catarrhal ophthalmia" which occurred three years after the injury and which left corneal scars. The vision of the left eye was 4/60 five years after the accident to its fellow eye.

*11. Reported by Fuchs<sup>10</sup> in 1905.*

The patient was a man, 33 years of age. One of his eyes was injured by a cow's horn. The sclera was ruptured and the lens was dislocated beneath the intact bulbar conjunctiva at the site of the rupture. Sympathetic uveitis began in the uninjured eye six weeks after the accident. Enucleation of the ruptured globe was performed seven weeks after the injury occurred. Pathologic study of the removed eye showed typical sympathetic ophthalmia.

*12. Reported by Fuchs<sup>10</sup> in 1905.*

The patient was a woman, aged 56 years, who suffered a subconjunctival dislocation of the lens from an injury by a cow's horn. The uninjured eye became inflamed six weeks after the injury, and the ruptured globe was enucleated several days later. It showed characteristic sympathetic ophthalmia on microscopic examination.

*13. Case of Dimmer reported by Fuchs<sup>10</sup> in 1905.*

The microscopic sections of the enucleated eyeball showed a subconjunctival scleral rupture. The iris which lay beneath the conjunctiva was more heavily infiltrated than the uvea in the eye.

*14. Reported by Weigelin<sup>24</sup> in 1910.*

The patient was 41 years of age. One eye was injured by a cow's horn. The damaged eye suffered a subconjunctival rupture of the sclera, with dislocation of the lens beneath the conjunctiva, and traumatic aniridia. Sympathetic uveitis of the fellow eye began 44 days after the injury, and enucleation of the injured globe was carried out three days later. Pathologic study of microscopic sections of the removed eye showed rupture of the sclera superiorly, with lens and iris lying beneath the conjunctiva. The subconjunctival mass was heavily infiltrated with small round cells. The infiltration extended around the lens and contained epithelioid cells and round cells. The ciliary body and choroid showed lymphocytic infiltration with sparse epithelioid and giant-cell deposits. Vessels extending through the sclera showed perivascular infiltration with lymphocytes.

*15. Reported by Weigelin<sup>24</sup> in 1910.*

The patient, 61 years of age, suffered an eye injury by a cow's horn, with en-

suingsubconjunctival rupture of the sclera and subconjunctival dislocation of the lens. The entire iris lay beneath the conjunctiva outside the globe. Sympathetic inflammation of the fellow eye began four months after the injury, and the hurt eye was removed seven days later. Microscopic study of this eye showed the subconjunctival mass to be heavily infiltrated with lymphocytes, epithelioid cells, and some giant cells. The intraocular tissues revealed only moderate infiltration of the ciliary body and choroid.

16. *Reported by Hussels<sup>41</sup> in 1914.*

The patient suffered an injury of the left eye from a cow's horn. The right eye became inflamed five weeks later, and the left eye was then enucleated. Studies of microscopic sections of the removed globe showed typical sympathetic ophthalmia. The right eye gradually cleared and recovered good vision, revealing, however, yellowish and pigmented areas of the fundus.

17. *Reported by Steitz<sup>42</sup> in 1935.*

An adult male injured his right eye with a broom handle. The vision of the injured eye was lost at once. Local treatment and dressings were applied. The left eye developed pain and blurring of vision two months after the injury. Examination of the right eye showed ciliary injection, a prominence nasally beneath the bulbar conjunctiva, a cloudy anterior chamber, absent iris at the nasal limbus, aphakia, hemorrhage on the anterior face of the vitreous, and vision equal to defective light projection. The left eye disclosed slight ciliary injection, hyperemia of the iris, a posterior synechia nasally, and visual acuity of 5/15. The right eye was enucleated. The inflammatory process in the left eye increased, with gradual failure of vision, total synechia, and cataract.

Microscopic study of the removed eye showed two subconjunctival scleral tears in the upper nasal quadrant with incarcerated iris and ciliary body. The lens, surrounded by connective tissue that was heavily infiltrated with lymphocytes and plasma cells, lay beneath the conjunctiva across the scleral wounds. Connective tissue, filled with plasma cells and epithelioid cells, occupied the space between the lips of the scleral tears. The iris and ciliary body were infiltrated, with occasional groups of epithelioid and giant cells in the uveal tract. The choroid was detached anteriorly by hemorrhage, and contained plasma cells up to the choriocapillaris. The retina was separated nasally and temporally.

18. *Reported by the author<sup>43</sup> in 1943.*

This patient was presented before the Ophthalmologic Section of the New York Academy of Medicine in a brief report. A detailed description of this interesting case is given below, together with a drawing and photomicrographs.

REPORT OF THE AUTHOR'S CASE

E. L. G., a white woman, aged 70 years, was seen on November 22, 1941, because of a "growth" of her left eye and failing vision of her right eye. She was referred to me by Dr. John Russell Twiss. The patient stated that the vision of her left eye had been poor since the age of 18 years, when this eye suffered from "keratitis and recurring intraocular hemorrhages." The onset of her present illness followed a fall eight weeks before I examined her. She said that she had struck her left temple region, and that a severe hemorrhage appeared in her left eye, followed by the presence of an elevated "growth" on the nasal side of the eyeball. Four weeks later, the vision of her right eye became obscured by "cobwebs," and

she consulted a local oculist who prescribed atropine drops and hot compresses, and advised removal of her seven remaining teeth. The extraction of the teeth had no effect upon her eyes, and the vision of her right eye failed rapidly.

Examination of her eyes, eight weeks after her fall, showed an inflamed soft right eye, with a plastic exudate in the anterior chamber, many posterior synechiae, incipient senile cataract, a cloudy vitreous, and vision equal to perception

case without evidence of cardiac failure (blood pressure 174/112), generalized arteriosclerosis, and chronic arthritis. Laboratory studies showed an elevated erythrocyte sedimentation rate (42 mm. at the end of one hour), clotting time of 4.5 minutes, bleeding time of 2 minutes, negative blood Wassermann test and Kline reactions, and normal urinalysis. The complete blood count revealed: RBC 4,360,000, hemoglobin 82 percent, WBC 6,800, color index 0.9. Differential white-

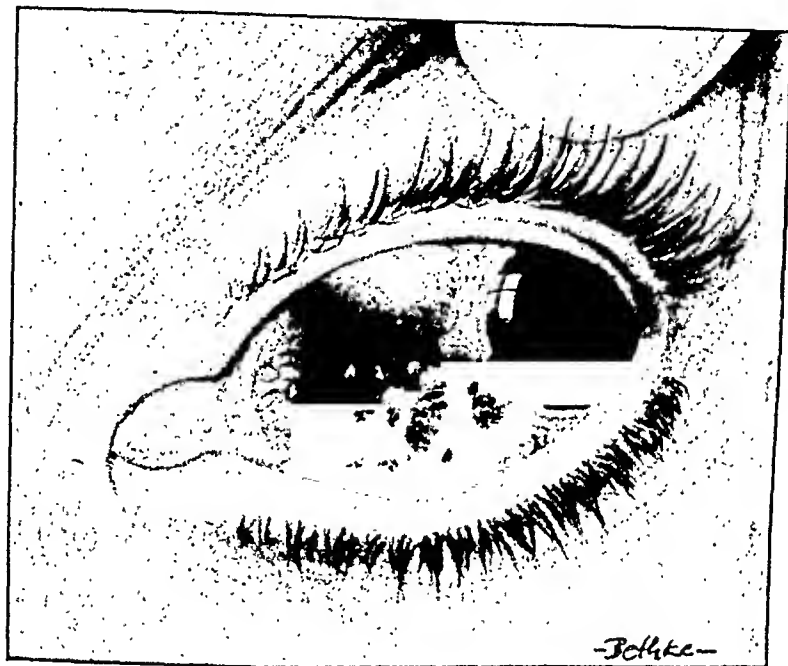


Fig. 1 (Perera). Photograph of artist's drawing of patient's left eye, showing prolapsed iris beneath bulbar conjunctiva and luxated lens above this.

of hand movements. The left eye disclosed marked congestion, a central corneal opacity, a projecting mass of inflamed prolapsed iris beneath the bulbar conjunctiva in the lower nasal quadrant, a yellowish rounded subconjunctival mass superior to the dislodged iris, normal intraocular pressure by palpation, and vision equal to the perception of light.

A thorough medical investigation by Dr. Twiss revealed a mild chronic disease of the tonsils, obesity (weight 182 pounds), hypertensive cardiovascular dis-

cell count: polymorphonuclears 74 percent, small lymphocytes 20 percent, large lymphocytes 1 percent, monocytes 4 percent, basophiles 1 percent. Blood chemistry investigations showed: Urea nitrogen 8.5 mg. percent, sugar 142.8 mg. percent, cholesterol 224 mg. percent, and icterus index 7.9 units.

The patient was admitted to the Institute of Ophthalmology of Presbyterian Hospital, New York City, with the clinical diagnosis of subconjunctival rupture of the left globe, subconjunctival dislo-

cation of the lens and iris of the left eye, and probable sympathetic ophthalmia. Dr. A. B. Reese kindly examined this patient and agreed with the diagnosis. Several kodachrome photographs of the patient's left eye were made. From these, Mr. E. G. Bethke made a colored drawing which was photographed by Mr. A. Marfaing and is shown in figure 1.

and blindness. The patient has recently suffered from a cerebral hemorrhage with accompanying aphasia and hemiplegia.

Pathologic study of microscopic sections of the removed left eyeball is recorded in the files of the Department of Pathology of the Institute of Ophthalmology of Presbyterian Hospital as follows:

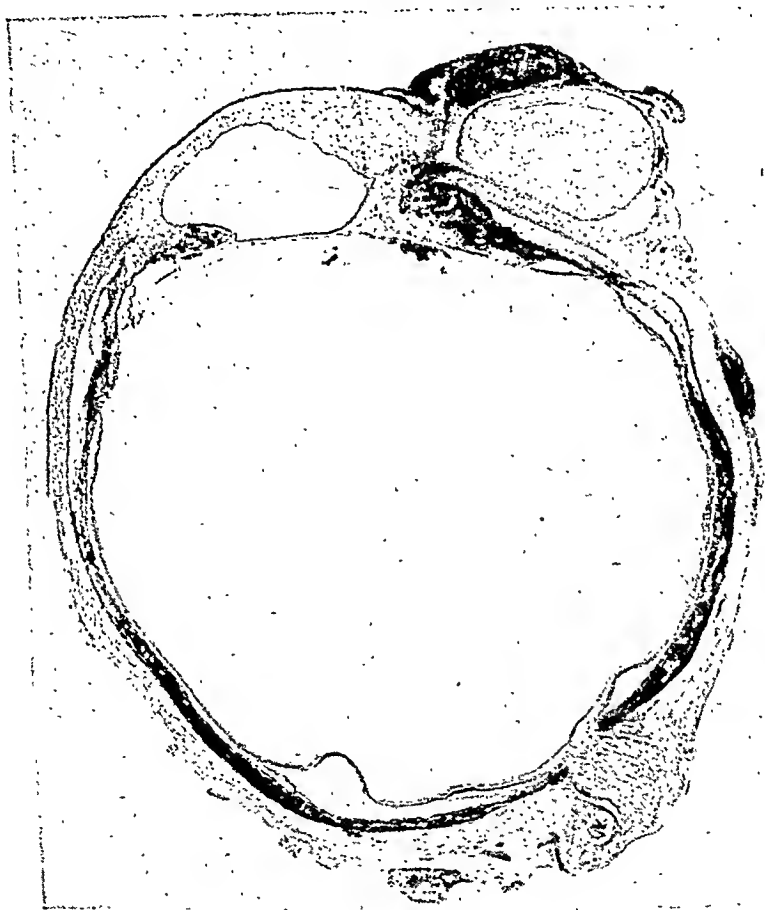


Fig. 2 (Perera). Photomicrograph of patient's left eyeball in cross-section to show intercalary rupture of globe and lens lying beneath the bulbar conjunctiva. A portion of the granulomatous mass of extruded iris tissue overlies the lens. Note the edematous swelling of the anterior lip of the scleral rupture and the flat detachment of the retina posteriorly. The ciliary body on the side of the rupture is heavily infiltrated, and the entire choroid is thickened and infiltrated.

Enucleation of the patient's left eye was performed 9½ weeks after the accident. Healing of the socket was uneventful. The right eyeball has gone on to shrinkage and degeneration, with yellowish-green discoloration of the iris, complete posterior synechia, dense cataract,

"The outer coat of the eyeball shows a rupture in the intercalary region nasally with the presence of the entire lens in its capsule and a mass of infiltrated uveal tissue lying beneath the nasal bulbar conjunctiva (figs. 2 and 3). The uveal tissue contains dispersed and disorganized



masses of pigment and a massive granulomatous reaction forming a tumorlike lesion made up principally of epithelioid cells and lymphocytes, with some plasma cells and a few giant cells (fig. 4). This mass of tissue lies inferior to the site of the lens and overlaps it without, however, invading the lens capsule. There is a con-

marked edema, with thickening and separation of its lamellas by fluid. The central cornea reveals loss of Bowman's membrane and the presence of a moderate amount of scar tissue in the superficial stroma. The intercalary region temporarily, on the side opposite the rupture, shows a distinct rarefaction. The anterior

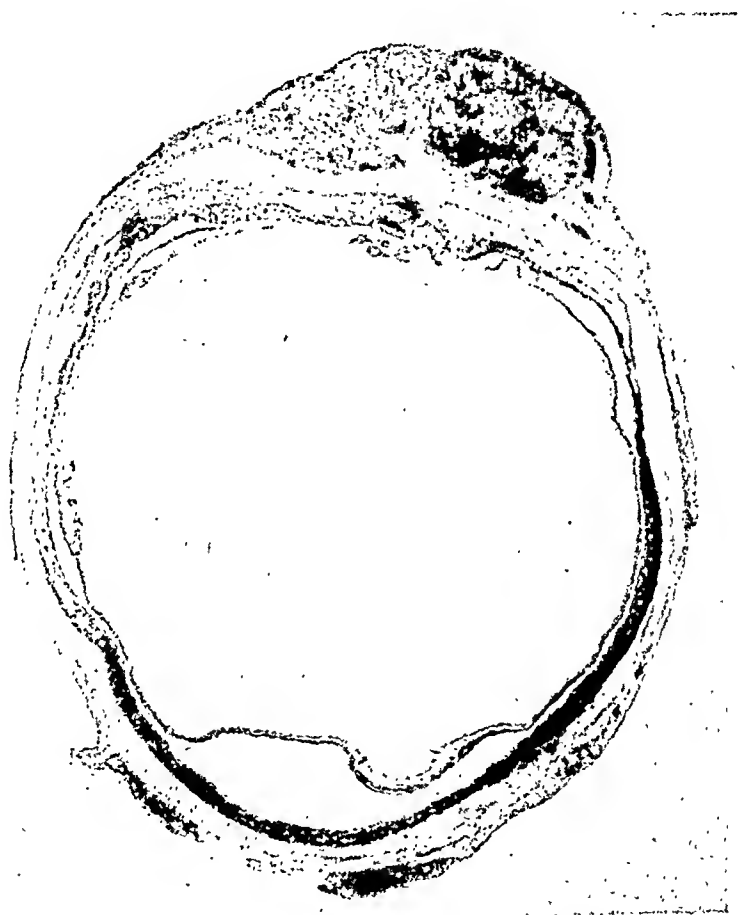


Fig. 3 (Perera). Photomicrograph of horizontal cross-section of globe to show tumorlike mass of granulomatous tissue containing disintegrating iris on the outer surface of the sclera. The retinal detachment and massive choroidal infiltration are seen inferiorly.

siderable amount of pigment phagocytosis. The lens shows wrinkling of its capsule and peripheral vacuolar changes in its cortex at the equator. The interior of the globe shows extensive changes, characterized by a massive thickening and infiltration of the choroid and ciliary body with epithelioid cells, lymphocytes and rare giant cells (fig. 5). The cornea adjacent to the site of the rupture shows

chamber contains albuminous pink-staining fluid, and the entire iris is absent from the interior of the globe. On the anterior surface of the vitreous lies a thin fibrous membrane which continues nasally to merge with a dense connective-tissue mass lying on the internal surface of the ciliary body nasally and extending into the area of the interruption of the continuity of the cornea and sclera. The internal sur-

face of the ciliary body, especially nasally, shows disintegration and disorganization of the epithelium, both pigmented and nonpigmented, and an outpouring of leukocytes between the ciliary processes. The retina shows irregular areas of flat detachment over its entire extent, with a deeply staining homogeneous material

the disc and a slight lymphocytic infiltration of its pial sheath. The vitreous reveals some areas of hemorrhage on the surface of the ciliary body nasally and beneath the membrane anteriorly.

*Conclusions.* This eye, which is the seat of old corneal scarring, has suffered a rupture at the nasal intercalary region



Fig. 4 (Perera). Higher power photomicrograph of an area in the granulomatous mass on the surface of the eyeball. In the center of the picture is a rounded area of giant cells and large epithelioid cells with disintegrated and phagocytosed pigment derived from the broken-down iris. Around this are masses of epithelioid cells infiltrated with lymphocytes and plasma cells.

separating the detached retina from the underlying degenerated pigment epithelium. Nasally the retina has been drawn forward over the pars plana of the ciliary body. The macular region discloses deposits of pink-staining hyalinlike material in the external layers, forming cystlike spaces of the external plexiform layer. The optic nerve shows slight edema of

with extrusion of the iris and the entire lens beneath the conjunctiva. The extruded uveal tissue has formed a tumorlike granulomatous mass of epithelioid cells, lymphocytes, and occasional giant cells. The interior of the globe shows a massive granulomatous infiltration of the uveal tract and a flat detachment of the retina.

*Pathologic diagnosis:* Injuries—indirect rupture of globe; injuries—subconjunctival luxation of lens; sympathetic ophthalmia following injury; cornea—scars. (The pathologic report was made by the author, and kindly reviewed and confirmed by Dr. A. B. Reese.)

brief. In cases 4 and 9, the pathologic report of the enucleated eye was suggestive of the diagnosis of sympathetic ophthalmia. In cases 5, 6, 8, and 10, the account of the removed globe was inadequate to make the pathologic confirmation of sympathetic ophthalmia. In Donaldson's patient,

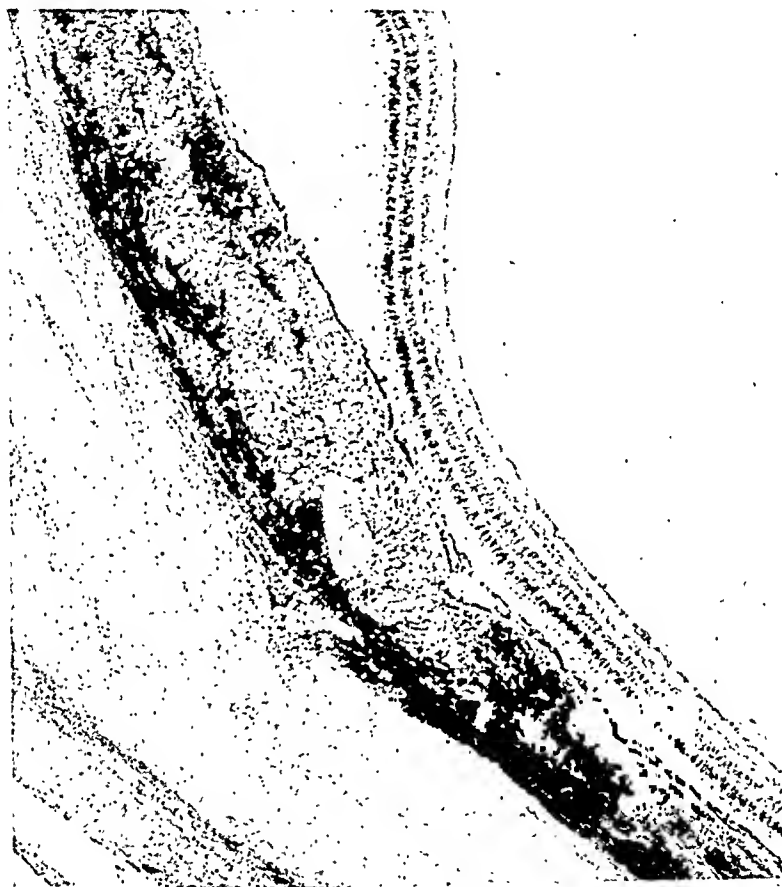


Fig. 5 (Perera). Photomicrograph of cross-section of posterior layers of eyeball, showing flat detachment of retina, massive infiltration and thickening of choroid with epithelioid cells, lymphocytes, and plasma cells, and dispersal of choroidal pigment.

#### COMMENT AND STATISTICAL SURVEY

A careful critical analysis of the foregoing case reports leads to the conclusion that the diagnosis of sympathetic ophthalmia following subconjunctival rupture of the eyeball was proved by the pathologic examination of the injured globe in eight instances (cases 11, 12, 13, 14, 15, 16, 17, and 18). Of these, the clinical history of case 13 was not given, and the description of case 16 was very

case 10, the onset of sympathetic uveitis in the uninjured eye occurred 27 days after removal of the damaged eyeball. Enucleation was not performed in cases 1, 2, 3, and 7, but the histories of these patients are clinically characteristic of sympathetic ophthalmia. In cases 1 and 3 the authors stated that the iris was not seen when the inflammatory process had subsided in the injured eye; but in these eyes the lens was dislocated under the

bulbar conjunctiva in the first and probably into the vitreous in the second, and there was no other evidence that the iris was lost at the time of the injury.

The rarity of sympathetic ophthalmia following subconjunctival rupture of the eyeball makes its frequency difficult to evaluate. The Report of the Committee on Sympathetic Ophthalmitis of the Ophthalmological Society of the United Kingdom<sup>44</sup> in 1886 uncovered 211 examples of the disease. Of these, only three fall within the criteria which I have stated for sympathetic ophthalmia following rupture of the globe. Some authors, such as Alt,<sup>45</sup> Theobald,<sup>12</sup> Joy,<sup>7</sup> Trowbridge,<sup>8</sup> and Irvine,<sup>4</sup> reported large series of patients with sympathetic ophthalmia with no instances of cases falling in the group described in this paper. Of the 15 proved examples of sympathetic ophthalmia from the collection of the Department of Pathology of the Institute of Ophthalmology of Presbyterian Hospital, New York City, my case was the only one which followed subconjunctival rupture of the eyeball. A review of 715 cases of sympathetic ophthalmia, taken from series of cases reported in the literature, revealed that only 12 are among those covered by the title of this paper. It thus appears that about 1.6 percent of cases of sympathetic ophthalmia result from subconjunctival rupture of the eyeball.

In a discussion of subconjunctival luxation of the lens, Ask<sup>46</sup> emphasized the great danger of sympathetic ophthalmia, and advised, contrary to the opinion of many earlier writers, the immediate removal of the dislocated lens and prolapsed uvea, or enucleation. The incidence of sympathetic ophthalmia after subconjunctival rupture of the globe with subconjunctival luxation of the lens varied from 20 to 40 percent, according to different investigators, but most of their examples do not fit into the more rigid

criteria which have been employed in this paper.

The sex distribution of the 18 cases reported in this thesis shows 8 males and 5 females, with the sex of 5 patients not given. Their ages varied from 12 to 70 years, and was not recorded in four instances.

TABLE 1

DATA FROM 18 CASES OF SYMPATHETIC OPHTHALMIA FOLLOWING SUBCONJUNCTIVAL RUPTURE

Case	Sex	Age	Time Interval before Onset in Uninjured Eye
1	male	—	7 weeks
2	male	38	6 weeks
3	male	50	5 weeks
4	male	58	6 weeks
5	female	40	4 weeks
6	—	48	7 weeks
7	male	45	25 days
8	male	12	3 weeks
9	female	43	10 months
10	female	33	47 days
11	male	33	6 weeks
12	female	56	6 weeks
13	—	—	—
14	—	41	44 days
15	—	61	4 months
16	—	—	5 weeks
17	male	—	2 months
18	female	70	4 weeks

The interval of time between the rupture of one eyeball and the onset of inflammation in the uninjured eye varied from 3 weeks to 10 months. The cause of the scleral rupture was injury by a cow's horn in 8 patients, contusion from other objects in 8 cases, and unknown in 2 instances.

## DISCUSSION

In all patients with subconjunctival rupture of the sclera, it is difficult if not impossible to exclude the possibility of an unnoticed minute wound of the conjunctiva. Even serial microscopic sections of the enucleated eyeball might not reveal a tiny tear of the conjunctiva which had healed during the interval of time between the injury and the removal of the globe. Since it is known that an infective

agent or virus can pass through intact conjunctiva, the presence or absence of a tiny conjunctival wound bears no weight in casting light upon the etiology of sympathetic ophthalmia.

My study is in accord with the findings of most writers that there is incarceration of lens or uveal tissue in nearly all instances of sympathetic ophthalmia, whether resulting from perforating traumatic or operative wound or from subconjunctival rupture. This fact, together with the certainty that sympathetic ophthalmia does develop in some patients after subconjunctival rupture of the globe, tends to favor the theory that allergy to uveal tissue or pigment plays a part in the etiology of sympathetic ophthalmia.

As Meller<sup>47</sup> has pointed out, there may be need for changing our conceptions of sympathetic ophthalmia, which may be present in cases other than those with perforating injuries. One form of so-called idiopathic uveitis may be idiopathic sympathetic ophthalmia, developing in patients whose uveas, injured through causes other than perforating wounds, have become sensitive to the etiologic agent of this disease.

The histologic features of sympathetic ophthalmia, including the widespread pigment phagocytosis, are compatible with the allergy theory of its causation, as Friedenwald<sup>21</sup> and Woods<sup>22</sup> have emphasized. My microscopic studies of the 15 examples of sympathetic ophthalmia in the collection at the Institute of Ophthalmology are consistent with their work.

#### SUMMARY

A brief survey of sympathetic ophthalmia is given. This includes its incidence, the rarity of its occurrence following subconjunctival rupture of the eyeball, a short discussion of its etiology, and a presentation of its pathologic findings.

The need for a critical study of the cases reported in the literature as examples of sympathetic ophthalmia is presented.

Records of patients with sympathetic ophthalmia following subconjunctival rupture of the eyeball have been reviewed.

This paper deals only with uncomplicated examples of sympathetic ophthalmia resulting from a subconjunctival rupture of the globe, including the complete report of the author's case. It seemed logical to exclude instances of surgical intervention following the injury, as well as those cases in which the conjunctiva was visibly torn, or an intraocular structure was lost at the time of the injury.

Of the 18 cases culled from the literature, only 8 were proved by pathologic study to be examples of sympathetic ophthalmia following subconjunctival rupture of the eyeball. The remaining 10 cases were considered to be presumptively valid enough to be included.

The frequency, sex distribution, and age of patients with sympathetic ophthalmia following subconjunctival rupture of the globe are given, as well as the interval of time between the injury and the onset of inflammation in the uninjured eye.

It is impossible to eliminate the possibility of a minute conjunctival wound in these cases.

This investigation is in accord with the studies of most authors who report the incarceration of lens or uveal tissue in nearly all cases of sympathetic ophthalmia.

The findings of the author are consistent with the theory that allergy to uveal tissue plays a part in the etiology of sympathetic ophthalmia.

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# WERNICKE'S DISEASE\* (ENCEPHALITIS HEMORRHAGICA SUPERIORIS)

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In 1881, Wernicke<sup>1</sup> described a clinical syndrome characterized by clouding of consciousness, varying ophthalmoplegias, and ataxia. Patients who were more severely affected went into stupor or into states of excitement, and many died within a few days. The cases Wernicke reported were all in inebriates, and he felt that some toxin, possibly alcohol, was the cause of the disease.

Shortly after this Jacobäus<sup>2</sup> described cases of the syndrome in which there was peripheral-nerve and spinal-cord involvement and he felt that Wernicke's description of the disease was too circumscribed. Many years later, Bender and Schilder<sup>3</sup> came to the same conclusion.

Although all the early cases reported were in alcoholics, Jacobäus advanced the idea, without offering proof, that alcohol *per se* was not the cause of the disease but that some nutritional disturbance was a contributing factor. This view was further advanced by Bender and Schilder.

In the last decade many reports of the disease in nonalcoholic patients began to appear in the literature. Of 14 cases reported by Neuberger,<sup>4</sup> 10 had malignancy of the gastrointestinal tract and 4 had chronic gastritis.

Wagener and Weir<sup>5</sup> reported three cases, two of the patients had severe post-operative vomiting and one the pernicious vomiting of pregnancy; all three developed ocular-muscle paralyses. Campbell and Beggert<sup>6</sup> also reported the disease

in patients suffering from chronic gastrointestinal disturbances and persistent vomiting from other causes.

Jolliffe and his co-workers<sup>7</sup> reported 27 cases of the syndrome that had been observed at Bellevue Hospital between the years 1935 to 1940; only 3 of these were in nonalcoholics. They concluded that some metabolic factors, rather than alcoholism *per se*, were the cause of the disease.

In 1938, Alexander and his co-workers<sup>8</sup> made a most important contribution to the understanding of the causes of this disease.

They found that if all the vitamins except thiamine chloride were fed to pigeons, the pigeons regularly developed Wernicke's syndrome. On the other hand, if all vitamins, except thiamine chloride, were removed from the diet, Wernicke's syndrome did not develop.

Von Grosz<sup>9</sup> reported muscle paralyses in cases of vitamin-B deficiency and they and Wagener<sup>10</sup> noted the rapidity of cure if large doses of vitamin-B were promptly given.

Prickett, Salmon, and Schroeder<sup>11</sup> produced peripheral-nerve degeneration in rats by feeding them diets deficient in vitamin B. Axelrod, Spies, and Elvehjem<sup>12</sup> ruled out riboflavin as a cause of the disease when they showed that the riboflavin content in the blood and muscles was the same in pellagrous as in normal controls. They also showed that in vitamin-B deficiency there was a lack of a co-enzyme factor which in some way affected the oxidation process in muscles.

\* Read before the Brooklyn Ophthalmological Society in February, 1945.

According to Veasey,<sup>13</sup> thiamine chloride is the antineuritic or beriberi-preventing factor in the vitamin-B complex.

It is now agreed that thiamine chloride is a catalyst for carbohydrate metabolism. If absent, carbohydrate metabolism is arrested at the pyruvic-acid stage; and, in fact, the amount of pyruvic acid is a measure of the deficiency. Pyruvic acid is toxic to nerve tissue, and its deleterious action is enhanced by the presence of other noxious agents, notably alcohol, and by diabetes and other toxemias, such as the toxemia of pregnancy. The most severe cases, particularly those ending fatally, are in the chronic alcoholics; hence the disease originally was thought to be due to alcoholism. Alcoholism results in a chronic gastroenteritis which interferes with vitamin and food absorption and it also causes damage to the liver, an organ which plays a vital role in vitamin metabolism.

The pathologic changes in this disease have been extensively studied. According to Jolliffe, the lesions are confined to the periventricular gray matter, and are characterized by small foci of degeneration and varicose deformities of the blood vessels. There is subacute necrosis of the adjoining parenchyma, and small petechial hemorrhages are frequently found throughout the lesions. The areas most constantly involved are the nuclei of the thalami, hypothalami, and mammillary bodies. The region of the midbrain, especially the third and fourth nuclei, the nuclei of the vestibular nerves, and the dorsal nuclei of the vagi are also frequently involved.

Gamper<sup>14</sup> pointed out the constancy of involvement of the mammillary bodies in the Korsakoff syndrome, a condition due to alcoholism.

Ecker and Waltman<sup>15</sup> stated that the lesions in Wernicke's disease are most common in the gray structures of the

brain near the third and fourth nuclei and in the region of the aqueduct of Sylvius.

The treatment is thiamine chloride in large doses. Prickett, Salmon, and Schroeder showed that the disease could be cured only in its early stages. Later, damage to the nerves becomes irreversible, and even massive doses cannot cause regeneration of the nerve tissue. In fact, the condition may progress and even end fatally.

Wagener made the interesting observation that the oculomotor paralyses are the most resistant to treatment, a fact shown in case 1. Conversely, Jolliffe noted that in those cases in which the ocular motor nerves showed signs of clearing, recovery from the disease was usually complete and rapid. This is exemplified in the third case here reported.

Wernicke's disease is a neuro-ophthalmologic disorder due to thiamine-chloride deficiency. Alcoholism and other diseases that interfere with food and vitamin absorption from the gastrointestinal tract make the condition more severe and more difficult to cure. Wernicke's syndrome may be more frequent than the reports seem to indicate, and in some of the cases in which there are ocular-motor paralyses the latter may be a symptom of this disease, rather than the more commonly diagnosed "stroke" or "vascular sclerosis."

The recognition of this condition is important because early and adequate therapy is necessary to effect a cure.

#### CASE REPORTS

*Case 1.* D. Y., Chinese, male, single, aged 39 years, a laundry worker, seven years in this country, came to the clinic of the Jersey City Medical Center on November 17, 1939, with a history that about one year ago he noticed that his eyes were becoming prominent. He thought that the right eye was first in-



involved. During the past few months the prominence of the eyes had become progressively worse. He also noticed that he had to turn his head to see objects to either side of him.

Because of the prominence of the eyes, a thyrotoxicosis was diagnosed, but as several basal-metabolism readings, taken over a period of months, varied from plus 6 to plus 14, that diagnosis was dropped.

On June 17, 1940, the patient was referred to the Post Graduate Hospital for study.

*Physical examination.* The patient had a wide staring expression, such as is seen in advanced cases of thyrotoxicosis. The upper lids were markedly retracted. The exophthalmometer readings were 17 mm. right and 15 mm. left eye. There were a definite lid lag on movement of both eyes downward, and a complete absence of upward gaze. Both superior recti were completely paretic. The inferior obliques and the external recti were almost entirely paretic. The internal recti were moderately weak, but convergence was completely absent. The superior obliques were only mildly involved. The pupils were equal and regular and reacted to light and accommodation. The sensitivity of the cornea of the left eye was reduced, and there was marked congestion of the conjunctival veins. The fundi were normal. Except for numerous nodules on the skin, no other physical abnormalities were found.

The possible diagnoses were sarcoid, lymphoplasma, and trichinosis. The possibility of thyrotoxicosis was considered and ruled out.

Thorough laboratory studies were made. X-ray studies of the chest, long bones, and skull were negative for pathologic change. Examinations for trichinosis were negative. Except for a mild

anemia, the blood showed no abnormalities. The urine was negative for Bence-Jones proteins. Five stool specimens were positive for the ova of *Clonorchis sinensis*, and sections of several tumors removed from the skin showed them to be areas of mucinous degeneration of the subcutis.

The patient was discharged from the Hospital on June 28, 1940, and referred back to the outpatient department with no definite diagnosis.

Somewhat later, the possibility of Wer-nicke's disease suggested itself and the patient was placed on large doses of thiamine chloride and vitamin-B complex.

On January 3, 1940, the external recti showed increased motility and there was some improvement in the functions of the inferior obliques. By April, the exophthalmos was becoming less apparent, and there was further improvement in the functions of the ocular muscles. By January, 1941, all ocular movements, except upward gaze, were practically normal.

The patient was last seen on April 4, 1941. The staring expression due to the retraction of the lids had practically disappeared and, except for a slight weakness in upward gaze, the ocular-muscle paralyses had disappeared.

*Case 2.* M. H., a man, aged 22 years, an accountant, came to the Jersey City Medical Center on July 6, 1941, with the complaint that three months ago his eyes began to feel tired after work and that he had headaches in the evening. He developed dizzy spells during which objects in the room seemed to move to the left. About two months ago, he noticed that the left eye was unable to look to the left and that the left side of his face and forehead was paralyzed. About two weeks ago, vomiting without preceding nausea started. The vomiting was somewhat forceful and came about two to three

times daily. Since he had begun vomiting, the dizzy spells had become more frequent. There was no history of any acute illness preceding the onset of the symptoms. The past history was irrelevant.

The patient was admitted to the neurologic service with the following findings:

There was slight swaying on the Romberg test. The deep reflexes on the right were slightly hyperactive. The palpebral fissure of the left eye was narrower than that of the right. The pupils were equal and regular and reacted to light and accommodation. The external rectus and the obliques of the left eye were completely paralyzed. The left internal rectus was weak; the right internal rectus and the obliques were completely paralyzed, while the external rectus was very weak. The other ocular muscles were not affected. The fundi were normal. There was a complete peripheral facial paralysis on the left side. The neurologic and medical examinations were otherwise negative.

Triple-typhoid vaccine, starting with 25 million and doubling the dose each time was given on July 10, 11, 12, and 13, 1941, with fair febrile reactions.

The patient continued to grow worse and left the hospital on July 17, 1941, without a diagnosis. About six weeks later a high-vitamin diet together with large amounts of vitamin B<sub>1</sub> was given by mouth.

On November 1, 1941, the ocular motor functions had improved about 90 percent, and the left facial paralysis had disappeared. A month later the patient was completely cured of all paralyses and has remained so since.

*Case 3.* R. R., a woman married, aged 33 years, came to the outpatient department of the Brooklyn Hospital on September 18, 1944, with a history of menorrhagia and spotting for a long time.

Examination showed vaginal bleeding, and she was admitted to the Hospital on the gynecologic service.

September 19th, under spinal anesthesia, a dilatation and curettage and a cauterization of a cervical ulcer were performed. While making rounds a few days later, it was noticed that the patient had ptosis of both upper lids and other ocular-muscle weaknesses. This, the patient said, had been present for several weeks prior to her admission to the Hospital. She was transferred on September 26, 1944, to the medical service with a diagnosis of myasthenia gravis.

Examination showed ptosis of both upper lids, very poor ability to converge, and weakness of all ocular muscles. There was cheilosis at the angles of the mouth, and the tongue was very red, smooth, and appeared to be enlarged. A diagnosis of vitamin-B deficiency was made.

Further history elicited the fact that the patient had been on a substandard diet for a long time.

Large doses of vitamin-B complex and a high-vitamin diet were prescribed.

On October 6, 1944, all the ocular-muscle paralyses and weaknesses had disappeared. There was still some cheilosis present at the angles of the mouth and the tongue was still moderately red and smooth. The patient was discharged from the Hospital as cured on October 7, 1944. By November 1, 1944, the cheilosis and glossitis had completely disappeared.

#### SUMMARY

Three cases of superior encephalitis of the Wernicke type are reported, wherein there was no history of alcoholism, but which were due to dietary deficiency.

There were complete cures in the second and third cases and an almost complete cure in case 1. In the last-named, the disease had been present for a much

longer time and the symptoms were much more severe and had reached the irreversible stage, but fortunately to only a small extent. It is interesting to note that only in case 3 were other features of vitamin-B deficiency present; namely, cheilosis and glossitis.

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# ANGIOID STREAKS IN THE DEEP LAYERS OF THE RETINA\*

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Angioid streaks, those peculiar bands forming a more or less complete peripapillary ring with radiating branches, have been discussed for years. A host of concomitant signs have been written into the clinical descriptions, and emphasis has often been placed on them as though they were a distinctive part of the disease.

Numerous theories have been advanced to explain them. Some of the discarded ones have been slightly changed and re-introduced, but since the advent of the rupture of Bruch's membrane theory many writers have accepted it as a proved fact. I am not as yet convinced that it is more than a hypothesis, for, obviously, it does not explain all cases. Some papers have been published that lead the uninformed to believe that the rupture and the accompanying pseudoxanthoma elasticum are part of the same process. This certainly is not true in all instances.

An extensive review of the literature is not included for two reasons: first, because some cases have been reported more than once by different recorders, causing considerable duplication, and, second, the work has been very well done by Scholz. He not only compiled the bibliography but also published several fundus photographs illustrating small streaks, very broad ones, macular degeneration, and choroidal hemorrhage. His review does not register the work of Dimmer and Pillat, who published the first book of fundus photographs which includes several angioid streaks, nor does it mention those shown by me in 1932 and subsequently published. He has, however, done an excellent job, for anyone who has at-

tempted a complete bibliography has found to his annoyance that some reports were overlooked.

After going over the Scholz review, the reader is referred to Wagener's enlightening, discursive paper.

Law presents an excellent article which commands attention because of his superior professional skill. What he describes as pigmentary debris and extracellular uveal pigment is sufficient, I believe, to explain the appearance of most of the streaks, and especially the great peripheral collections of round, red spots. I am, however, at a loss to understand why folds produce such a strange lack of even a semblance to a regular outline—that is, a moth-eaten edge. I agree with one of his conclusions, that "there is no necessity to invoke the occurrence of clefts in Bruch's membrane in explanation of angioid streaks, since none is present in this case."

Batten includes many of the accompanying diseases and suggests linking angioid streaks with them. This may prove to be true, but at this time, after going over many fundus photographs of vascular disease and a few of angioid streaks, I wonder if the theory has not outrun the facts.

It is futile to continue academic discussions when photographs furnish convincing proof. The streaks are flat. Vail made this point in 1928. The photographs I took of the eyes in the case which he presented at the meeting of the American Medical Association's Section of Ophthalmology seemed to substantiate his claim, as have all that I have studied since that time. I am unable to confirm the observations made by Clay, that pressure on the globe causes the streaks to disappear, nor have

\* Presented at the eightieth annual meeting of the American Ophthalmological Society, at Hot Springs, Virginia, June, 1944.

I succeeded in establishing any familial tendency or relation to injury.

Without photographs, it is very difficult to be certain that a given streak has become larger or longer, or even to determine when it disappears, for an overshadowing retinal disease, such as common senile macular degeneration or retinal hemorrhage, may, for a time, completely obscure it. Later, when the blood or exudate has disappeared, the unchanged streak is found in its old location. There are, however, verified cases in which the streaks have widened, lengthened, and reached to the granular, spotted, peripheral fundus. In other cases, the faint, grayish-yellow limiting borders have become wider and wider until eventually only a delicate tracing of the red streak remained. The observer must be very careful to analyze each streak to avoid error in labeling an impression a fact.

Scholz reports that only 46 patients were seen for over a year. He referred to Oeller's patient, whom Fleischer, in 1938, reported as having had good vision for 23 years after the streaks were discovered. Later, macular involvement reduced it. This is supporting evidence of my contention that the presence of other signs is by no means proof of common cause. Cases have been reported wherein the streaks became thinner, darker, and less distinct. Zentmayer's case is illustrative.

Scholz states: "Of patients who were followed for more than a year, 33 percent showed an increase in the number of streaks; in 56 percent the condition remained unchanged; and in 10 percent the streaks decreased in number. The vision remained, on the whole, unchanged except as influenced by macular pathologic changes."

This is interesting, but I wonder what the conclusions might have been had they been based on the documentary evidence

of photographs. I am inclined to believe that they would be different.

In some patients, as we will show, Segrist pigment spots develop on the streaks. The bands following choroidal or retinal detachment do not look like angioid streaks.

There is complete agreement among competent authors that the streaks are always beneath the retinal vessels, but there is some difference of opinion in relation to their position when choroiditis develops. I believe they are in front of the scars, and that they can be traced over the pigment or atrophy.

Narrow circumpapillary atrophy as such has nothing to do with the streaks, for it is a common finding in eyes without any pathologic condition, a fact readily conceded after the examination of a series of selected stereoscopic fundus photographs.

Furthermore, when degenerative macular lesions develop, they follow the usual clinical course of deep retinal or superficial choroidal hemorrhage, exudate, edema, expanding ring of blood, and increasing exudate. After many months the recurring hemorrhages stop, the exudate becomes organized, and the scar persists through life. I do not conceive this to be an integral part of angioid streaks.

The object of this paper is to record the observations made during the past several years on angioid streaks, with special details of the findings in four cases, one of which was under observation for a short time, the second for 4 years, the third for 8 years, and the fourth for 14 years.

#### CASE REPORTS

CASE 1. M. S., a man, aged 36 years, healthy, single, in the Armed Forces, came for an examination because he was dissatisfied with his Army glasses.

*Examination.* Right eye: vision 20/100. With a  $-2.50\text{D. sph.} \approx -50\text{D. cyl. ax. } 180^\circ$  it was 20/20. The pupil was 3 mm. in diameter, regular, and active. The media were clear and the disc was slightly oval. The retinal vessels followed a common pattern and were normal. The inferior artery and vein paralleled each other for some distance until the artery crossed the vein without indentation or any variation in caliber. The superior temporal artery crossed in front of the vein and was without pathologic change. Surrounding the temporal and superior half of the disc was a pale, indefinitely outlined, narrow arc, the base of which was slightly uneven, thickest at the superior edge of the nerve-head. The outer border of this depigmented zone was the darker. There was a fine, red line beneath the retinal vessels starting from about the 5-o'clock position, and extending inferiorly to the 9-o'clock. This streak was not of equal diameter throughout, and it was not exactly in the same level—deepest at 9 o'clock and most forward at 5 o'clock. Near the nasal side of the disc there were a few interlacing angioid streaks. The background of the fundus was mottled with moderately heavy pigment. The dark, macular area was clearly and distinctly outlined; the center had a slightly granular appearance, and the vessels supplying it were of normal size and distribution.

Left eye: vision 20/200. With a  $-2.75\text{D. sph.} \approx -50\text{D. cyl. ax. } 180^\circ$  it was 20/15. The disc was clearly and sharply outlined, with an increased prominence of the translucent nasal half. The border was clearly discernible, with a narrow temporal pigmented margin. The retinal vessels and the macular region were normal. The latter was outlined by fine, stippled pigmentation. The fundus background was mottled. The angioid streaks were arranged in an extremely

delicate network, separated from the disc by a pale arc. They were, with the exception of a short isolated one, near the inferior temporal disc border, all confined to the nasal side, thin, red lines, more or less concentric to the disc. There were two dark spots almost as red as the streaks, one at the 3-o'clock and the other at 4-o'clock position. The peripheral fundus was negative in each eye.

*Diagnosis.* This was a case of very fine streaks unassociated with any other fundus change, thereby proving that it is possible to have angioid streaks in otherwise negative fundi.

CASE 2. M. O'C., a woman, aged 30 years, married, has been under observation for four years. The only interesting point in her history was the fact that "10 years ago there was considerable question as to whether I should continue at school because my sight was defective." Two and one-half years prior to examination she lost her vision for one month. At that time, her tonsils and all her upper teeth were removed, although there was no evidence of dental disease. Her Wassermann reactions were negative.

*Examination.* When she first came under supervision the vision of the right eye was 20/30 and Type 1. Her total refractive error was  $+.50$ . The pupil was 3 mm. in diameter, regular, and active. The media were clear. The disc, sharply and distinctly outlined, bulged forward about 2 diopters. The swelling was translucent and, of course, the nasal side projected farther. Surrounding the disc was an interrupted pigment line with very slight general pigmentation in the inferior segment and a broad, irregular, oval, depigmented zone from the 8- to the 11-o'clock position. This, in its broadest dimension, was wider than the disc and faded imperceptibly into the normal sur-

rounding structures. The retinal vessels were of normal size and distribution.

Beneath them and surrounding the disc was a mesh of red streaks, varying in width from the widest at the 9-o'clock position to the narrowest at about the

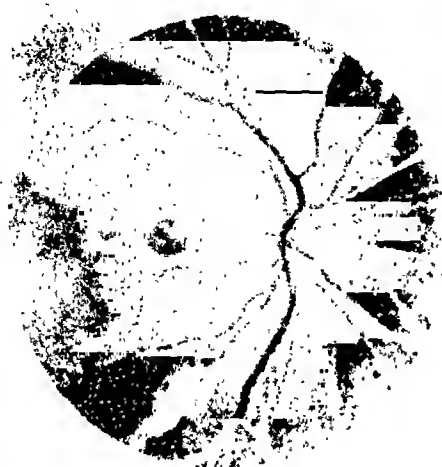


Fig. 1 (Bedell). Case 2. Right eye. July 27, 1940. Branched angioid streaks beneath the retinal tree; two large patches of choroidal pigmentation.

12:30-o'clock position. They all radiated from just beyond the margin of the nerve-head but did not come from exactly the same circumferential area. They were most numerous to the upper, inner side, where they formed an irregular network. Several streaks extended a considerable distance. One, passing anterior to a small choroidal scar, was more than 3 disc diameters in length, and more than twice the width of the largest vein, the end partly obscured by a gray covering and surrounding cloudiness. The other two were shorter and narrower.

There were four streaks in the inferior nasal quadrant. Some of them were the same width as the upper ones. A streak, extending almost vertically downward from the 6-o'clock position, was considerably broader but shorter, the surface was uneven and the color varied; in places

it was quite red, in other spots practically as pale as the contiguous fundus. The longest streak started at about the 5-o'clock position, and passed almost straight downward; the outline was wavy, the edge serrated, the caliber variable, and after extending 4 disc diameters it merged into the red, granular periphery.

The streaks on the temporal side were divided into three groups; the superior temporal ones consisted of two major branches which arose from near the disc border, were beneath the corresponding retinal vessels, and in front of a small choroidal scar.

An interesting streak extended from the 9-o'clock position for about  $3\frac{1}{2}$  disc diameters. It was faint, on the whitish base of depigmented peripapillary atrophy. About 1 disc diameter from the disc there was a round dark patch of choroidal pigment with pale borders, over which the streak could be traced. Farther temporally, there was a short space where the red, granular streak was again clearly seen before it passed over a linear, choroidal scar above the irregularly pigmented macula to become a narrow, bright-red tortuous line before it entered the red speckled peripheral region.

Beneath the inferior temporal artery was a long, somewhat spearhead-shaped mass of dark, almost black, choroidal pigment. The retinal artery passed in front of it. Between the two largest choroidal scars, in the inferior temporal region, proximate to the disc, there was an irregular, granular, oblique red streak. On the nasal side, at about the 4-o'clock position a long streak extended obliquely toward the periphery and was traceable for 4 disc diameters. Part of its course paralleled the vein (fig. 1).

Vision of the left eye was 20/20, total refractive error +.50D. sph.  $\approx$  +.25D. cyl. ax. 75°. The pupil was 3 mm.

in diameter, regular, and active. The media were clear. The retinal vessels were normal. The surface of the oval, elevated disc was uneven, with several colloid masses on the nasal side. These were translucent, and the pigment on the disc

for 3 disc diameters. It narrowed abruptly, and finally merged into the red granular dots which encroached upon the otherwise clear macular area.

*Three years later.* In the right eye there was a wider zone of choroidal absorption

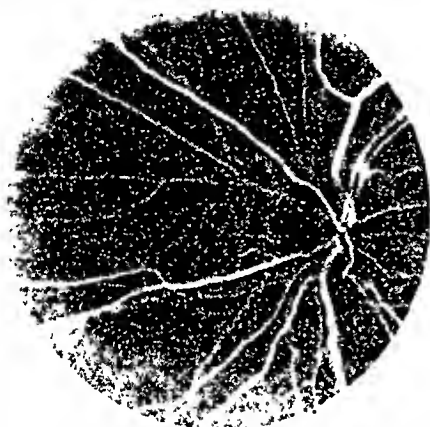


Fig. 2 (Bedell). Case 2. Left eye. July 27, 1940. Angioid streaks to the nasal side of the prominent disc.



Fig. 3 (Bedell). Case 2. Left eye. September 22, 1943. A very large, flat streak curves about the inferior border of the macular area.

could be dimly seen through them. Smaller collections were near the inferior disc border. The disc was clearly outlined by a faint arc of pigmentation. Beyond it was a paler band with a dark and finely granular edge. Surrounding the disc was a network of fine reddish streaks. These were smaller than those observed in the right eye, but otherwise they had the same characteristic tortuous outline, variable pigmentation, and, in places—particularly at the 8:30-o'clock position—there was a faint line about a portion of the streak. Altogether, there were 10 radiations from the circumpapillary ring. Some streaks were several disc diameters in length and were often parallel to and directly beneath the retinal vessels (fig. 2).

On the temporal side the circumpapillary ring was less defined, and there was only one broad oblique streak, which stretched from the 3:30-o'clock position

about the disc, the red streak near the macula was brighter. In the periphery of the fundus there were more fine red granules and the superior streaks were wider.

In the left eye, the changes had been slight; two were noteworthy: (1) At the end of the oblique streak which curved about the lower margin of the macular area the granules were more widely separated and (2) the faint, oblique, pale band near its termination had increased slightly in width, with irregular pigmentation in and about it (fig. 3). There has been no perceptible change in the past year.

**CASE 3.** A woman, aged 29 years, has been photographed at irregular intervals for the past eight years, and was referred by Dr. T. L. Terry of Boston, with the report that he had found no evidence of



osteitis deformans, but that she had a small patch of pseudoxanthoma elasticum on her neck.

*Examination.* On May 6, 1937, the patient seemed to be entirely well; she had never had any serious illness. The ex-

but not at an equal distance from its border, was a broad dark streak of brownish-red granules. From the upper edge where the band was closest to the nervehead, three streaks fanned outward. The broadest was short and divided into



Fig. 4 (Bedell). Case 3. Right eye. May 6, 1937. Broad, circumpapillary streaks, and a white-walled superior temporal one. A wide, white band above the macula.



Fig. 5 (Bedell). Case 3. Left eye. May 6, 1937. Heavily pigmented streaks on the nasal side, and a very delicate, vertical one between the disc and macula.

amination of her fundi, confirmed by the photographs, proves that new streaks do develop and that others undergo distinctive changes, such as an increase in the whitish streak margin, the formation of small, white, nodular masses, an occasional deposit of black pigment in or over the streak, and also fine white flecks near the distal end of the streaks where they merge into the region of red granules. The broad streaks in the right eye showed marked differences in color, in places a pale gray and in others dark red. In the left eye, there was a progressive broadening and lengthening of the streak and the oblique white band became whiter.

Vision of the right eye was 20/50; with a  $-0.75$ D. sph. it was 20/20. The disc was almost round, with a small, central excavation. The retinal vessels were normal. Completely surrounding the disc,

two parts about one-fifth disc diameter above the border. The longest and narrowest was at the 10:30-o'clock position, whereas at the 9-o'clock there was a long streak which passed above the macula and was partially concealed by an overlying long, linear, white scar (fig. 4). There were several small, pigmentary collections about the macula. From the inferior border a broad streak, consisting of what appeared to be dark red granules, had an irregular outline, and extended downward about 3 disc diameters. Fine white dots were near its frayed end. On the nasal side there were no radiations from the peripapillary band. All of the streaks were deeper than the retinal vessels.

Vision of the left eye was 20/30; with a  $-0.75$ D. sph. it was 20/15. The pupil was 3.5 mm. in diameter, regular and active. The media were clear. The retinal

veins and arteries were of normal size and distribution. The clearly and distinctly outlined disc was surrounded by an irregularly pigmented ring similar to that in the right eye, but the branching angioid streaks were narrow and less pigmented.

Three years later, this particular streak was a jagged band the width of the largest vein. It tapered to a thin line several disc diameters from the inferior temporal border of the disc. Examination showed that from this streak, at about the 3-o'clock



Fig. 6 (Bedell). Case 3. Right eye. February 5, 1944. Seven years later. The streaks are decidedly broader. The white lines along the streak have increased; the band in the macular region is smaller.

From the circumpapillary ring, there was an upward extension, twice the width of the vein, which tapered into a pigmented area similar to that described in the right eye. The outline of all of the streaks was ragged. There were two other streaks, one at the 10-o'clock and the other near the 6-o'clock position. On the temporal side of the disc there were three distinct dark-red spots, about three quarters of a disc diameter from the temporal border. A faint, white line, with a central, thin, reddish streak, extended from near the temporal border at the 2:30-o'clock position and passed above the macular region. There was a scarcely perceptible, fine streak with an extremely delicate prolongation, starting about one-half disc diameter from the temporal border of the disc, slightly above the white line and passing downward toward the 5-o'clock position (fig. 5).



Fig. 7 (Bedell). Case 3. Left eye. February 5, 1944. Increased pigmentation in all streaks, especially marked in the one between disc and macula.

position, a branch was in the center of the pale white streak which was much less defined than formerly and, instead of being a continuous line, was broken by two whitish spots. The pale zone surrounding the disc had increased in width at the lower border, where a ragged streak and a small artery passed over it.

The streaks in the upper half of the fundus showed marked wall changes. Whitish spots developed over several of them and a few black spots, ophthalmoscopically similar to Segrist's dots, were present in one.

Later in the same year the oblique streak above the macula was less visible, but two distal whitish spots were found. The fine, granular, dark-red spots had spread from the temporal side until they were only about one disc diameter from the fovea.

By June 3, 1943 a white spot had de-

veloped alongside the enlarging, inferior temporal streak.

When last examined, February 5, 1944, the individual spots along the course of the temporal streaks were brighter, but through each the angioid streak could be traced. The gross pattern had, with the exception of the temporal streak, remained much as it was in the beginning (figs. 6 and 7).

*Summary.* The changes in the left eye, which developed in eight years of observation, were the development of new streaks, of white spots along the course of several, a decrease in the visibility of the walls of one, an increased opacity near the inferior border of the disc and the encroachment of the red, granular, peripheral spots.

In the right eye, white spots formed along some of the streaks. The broad, white, irregularly outlined, superior macular streak became narrower and dark, granular spots collected on its surface.

When last examined, the vision of the right eye was 20/20; of the left eye 20/20. There was an irregularly enlarged, horizontally oval, blind spot in the right eye.

With the red light, the streaks were dark; with the yellow, chocolate brown; with the green, darker than with the yellow; whereas when illuminated with the unfiltered electric bulb they were dark, except where the light was reflected at an acute angle, when they were almost as red as the adjacent retinal vessels. The redness was most marked in the largest streak and best seen by focusing the light band on the retinal border of the streak.

The fourth case was recorded in the address of the Chairman of the Section of Ophthalmology, American Medical Association, in 1935. It has remained buried, for no writer on angioid streaks has ever mentioned it. I then stated that the streaks

were either in the deep choroid or between the choroid and the sclera. Now, as a result of more experience, better instruments, and improved photographic film, I believe them to be more superficial.

This is a very important résumé for the patient has been under observation from his forty-second to his present sixty-fourth year. During this time he developed varicose veins in his legs, a left-sided hemiopia, and his blood pressure ranged from 70/50 to the present 178/110. He has not developed any skin changes. His kidney-function tests and Wassermann were negative.

*CASE 4.* A vigorous-appearing printer was first examined on December 22, 1930. The Vision of the right eye was 20/15; total refractive error +.50D. cyl. ax. 90°. The pupil was 3 mm. in diameter, regular, and active. The media were clear. The clearly outlined normal-colored disc was surrounded by an irregular, partially depigmented zone, widest one-half disc diameter at the superior and inferior portions. The nasal inferior part of the disc was elevated, and the vessels curved over it. The retinal vessels were of normal size and distribution. Surrounding the disc, and forming the outer border of the pale circumpapillary area, was a brownish-red granular angioid streak from which many branches radiated. They were most numerous and shortest on the nasal side, where they formed a meshwork of broad bands. They were longest to the temporal side, where one streak paralleled the course of the temporal artery. The border of this and other streaks was pale. The macular area was clear (fig. 8).

Externally, the left eye was similar to the right. Vision was 20/20. The small disc was flat and clearly outlined by broad, angioid streaks, double on the nasal side, single on the temporal. From this red, granular ring, several broad bands were

projected, curiously frayed below, more defined above and nasally, and more granular on the temporal side. Frequently the streak seemed to lie on a pale band that was wider than the red portion.

The remaining part of the fundus was

near the red and speckled macula (fig. 9).

By 1938, the macular area was pallid, with a slight speckling. The streak on the nasal side, extending from the 9-o'clock position, was about 2 disc diameters in length, with a very small,

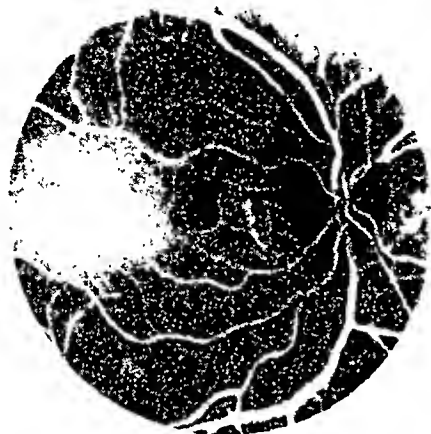


Fig. 8 (Bedell). Case 4. Right eye. December 22, 1930. Many flat streaks about the disc. Clear macula.

somewhat mottled; dark specks were within two disc diameters of the broad band that surrounded the nervehead. There was a definite ampulliform dilatation to the inferior nasal side of the disc. The streak extensions from this were granular; in places the pigment seemed to be absent, and the reduction in width of the streak was striking. Scattered about the disc were several granular spots of the same appearance but in no way connected with the streaks themselves. The macula was uninvolved, and the field of vision normal.

On May 7, 1937, the clearly outlined disc of the right eye was partially surrounded by a pallid zone, the outer margin of which was a reddish, granular streak with the extensions previously described. The darkest bands were in the inferior nasal quadrant, short, curved, thick. The temporal one was a yellowish-white stripe



Fig. 9 (Bedell). Case 4. Right eye. May 6, 1937. Increased pigmentation and widening of the streaks especially above the macula.

superficial, linear hemorrhage about the size of the largest retinal vein. The disc was pale and the surface rounded.

No great alterations were observed in the right eye until 1943, when the vision was reduced to 20/50. There was an irregularly outlined edema of the macula, with a pink base and several dark spots roughly arranged in two circles, the inner about one-fifth disc diameter in size and the outer about four fifths.

There was a partial dissolution of the overlying retina, with a yellowish-gray edge and many very minute yellow spots. Between the macula and the disc were two fresh hemorrhages: one, a narrow line, fairly sharp and distinct; the other was one-fourth disc diameter in width. Both were beneath the retinal vessels. There was another extravasation on the superior temporal border of the pale disc

about one-half by one-fifth disc diameter in size on the same retinal level. The disc had not changed in color but near the lower border was a white triangle, the distal margin of which was a streak. The retinal arteries were reduced in caliber.

three times the width of the largest vein. Its edge was frayed and it merged into the red, dotted periphery. The superior vertical streak became narrow before it reached the speckled area. The inferior streak, the most uneven in width, could

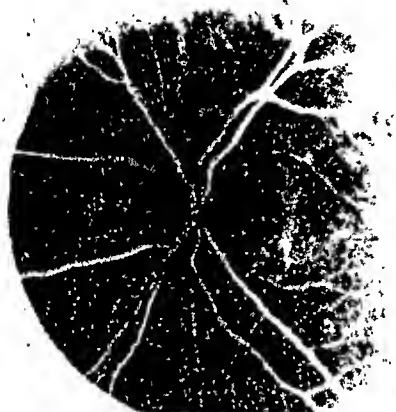


Fig. 10 (Bedell). Case 4. Left eye. January 3, 1939. Broad streaks about the disc. Irregular pigmentation above the macula.

The angioid streaks—a little wider, darker than the surrounding retina, and much darker than the fresh retinal blood—were still present, but because of the color of the entire fundus they were not so well differentiated.

In 1937, the streaks in the left eye showed practically no changes. The superior portion of the macular area was, however, definitely more mottled with several pale spots.

By 1939, this region showed a more diffuse pallor in a zone about five-sixths of the disc diameter. The retinal vessels were uninterrupted, but the background was distinctly redder than the adjacent retina; the streak forming its upper border was narrow. The disc surface was uneven. There were several pale spots with the characteristic reflex of drusen. The superior streak had a fuzzy outline. The upper nasal streak was in some places



Fig. 11 (Bedell). Case 4. Right eye. April 19, 1943. Extensive retinal hemorrhages on the disc and between it and the macula with beginning macular degeneration. The streaks remain.

be traced to the red dots (fig. 10).

In 1943, the vision of the left eye was reduced to 20/200, unimproved with glasses. The disc was pale yellowish, but the border remained sharply outlined and the zone surrounding it was practically unchanged. The streaks were a dark red-dish brown. There were a few isolated yellow accumulations about the streaks and a recent black spot at about the 2-o'clock position on the disc border. The streaks near 7 o'clock were distinct and more attenuated (figs. 11, 12, 13).

The angioid streaks were less sharply contrasted because of the macular edema, small superficial hemorrhages, and many fine white exudates dispersed about the lower half, most numerous and thickest near the disc. The macular region was similar in color but smaller than that in the right eye. The definition of streak

detail was as clear. The superior macular area streak was unchanged in size or length.

The differences between retinal hemorrhage and angioid streak were clearly seen.

in fundi that were otherwise negative.

During the progress of the disease, whitish or small black spots may appear in the streak.

The disc may be elevated and translucent.

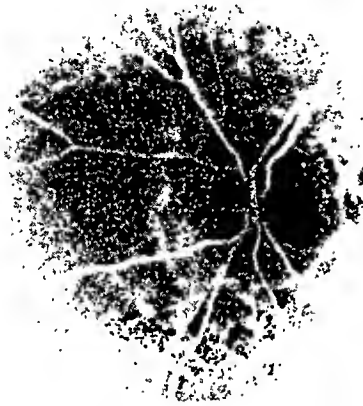


Fig. 12 (Bedell). Case 4. Left eye. April 19, 1943. Very large, broad, serrated streaks about the nasal side of the disc with irregular pigmentation to the temporal side.



Fig. 13 (Bedell). Case 4. Left eye. April 7, 1944. Broad streaks. White specks partially surround the degenerated macula. Several fine hemorrhages.

### CONCLUSIONS

Angioid streaks radiate from a circle surrounding the optic disc. The extensions from this ring vary in width or length; the individual pattern is distinctive.

Streaks may be very small, thin lines of a reddish color, or several times wider than the largest retinal vein and of a dark chocolate color. They may interlace and form a meshwork which is usually near the disc, or they may branch. They may fade into the adjacent tissues, have a frayed end which is sometimes overshoot by a gray clouding, or extend into the reddish granular periphery. The center of the streak may be so thin and pale that it is almost invisible, or the streak may be completely covered by a yellowish-white band. There may be an increase or a decrease in the granules which reflect the color. Angioid streaks have been found

When the disease has been existent for a long and unpredictable time, other fundus changes may become engrafted, notably massive pigment collections (usually dark brown or black), isolated small or extensive retinal and choroidal hemorrhages, or hemorrhages in and about the macula with the characteristic tendency to become absorbed when fresh ones appear, forming a circle or oval in which the retina first becomes edematous, then infiltrated, and, finally, permanently scarred.

It is probable that in all cases of advanced angioid streaks the equatorial zone and perhaps the extreme peripheral fundus are covered by fine, granular-appearing red dots. These spots have received very little attention in the literature and yet a careful scrutiny of the published drawings will show that some artists have seen them.

Several fundus photographs have been published. The earliest ones were in the Dimmer and Pillat atlas.

Too much notice has been given to the late or coincident signs and too little to the more accurate description of the life history of the streaks. Even in cases wherein the retina is the site of large hemorrhages it has been proved that the streaks are unchanged by the overlying blood.

A few observers have reported swelling of the nervehead. Law and others have recorded it, and it was present in two of the cases here cited.

No new theory is presented as to the cause of angioid streaks, nor is any theory so far advanced accepted without reservations.

#### SUMMARY

Very few cases of angioid streaks have been observed for long periods, and, as far as I know, none of them has been repeatedly photographed.

The white or yellow lines which follow

choroidal or retinal detachment have neither the color nor the texture of angioid streaks.

The streaks seem flat, but are not of uniform thickness, and the white spots which develop along some of them do not seem to be choroidal exudates.

Competent pathologists have examined many eyes with ruptures of Bruch's membrane, but have not found angioid streaks.

The theory that the streaks are blood vessels can, in the light of our present knowledge, be discounted, for no vessels have been found where the streaks develop and it does not seem probable that blood vessels could have the serrated edge so frequently seen in angioid streaks.

Streaks are presented here in which no hemorrhage was present and there was no evidence that there ever had been any.

Finally, even in the presence of very large retinal hemorrhages the streaks remain isolated and in no way connected with the fresh blood.

344 State Street.

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#### DISCUSSION

DR. GRADY CLAY, Atlanta, Ga.: In 1932, I first published in this country the association of angioid streaks and pseudoxanthoma elasticum, and since that time the reported association has become too frequent to be coincidental and therefore

the pathologic changes must be related. Since that original report I have seen 63 more cases; 30 percent of these cases are associated with pseudoxanthoma elasticum and 15 percent are familial. I have found no other related disease in this

group. Nineteen patients in my series were hospitalized and a very careful study of this group revealed no other associated diseases. One with only a few streaks died recently from a hypertensive disease. An autopsy was obtained, also one eye. The complete report is not yet ready for publication.

I still believe the disease is a disease of the blood vessels associated with elastic-tissue degeneration, and that the earliest changes seen are hemorrhages and the formation of the streaks in the choroid. After this acute period has passed, which may be a year or two, hemorrhages are rarely seen and no more streaks develop, and from this time on there is a slowly developing choroidal atrophy in the areas of the streaks, and in these areas the streaks will entirely disappear. Why should there develop such a definite area of choroidal atrophy if this disease is not primarily a disease in the choroid and a blood-vessel disease?

In my opinion, the true pathologic picture is not yet known, and unless one is fortunate to secure an eye early in the course of the disease it will not be known, for secondary changes too greatly alter the pathologic picture.

Pseudoxanthoma elasticum occurs without angioid streaks, and vice versa. All cases that I have seen which show few streaks do not show pseudoxanthoma elasticum. The degree of skin involvement is in direct relationship to the degree of fundal pathology. A patient showing the most marked disease of the two conditions is a woman aged 52 years, and the skin condition was noted by her mother at 3 years of age. She has a niece, 15 years old, showing the two conditions in an exaggerated type—the youngest I have seen.

The disease is most frequently seen in the routine examination of the fundus for as it does not affect vision unless a

streak should extend to the macula. In such cases hemorrhages are likely to occur and the end-result may resemble a disciform senile degeneration. I believe that many such macular lesions may be associated with angioid streaks.

DR. WILLIAM ZENTMAYER, Philadelphia, Pa.: From what has been said and shown here today, there seem to be as many opinions among the clinicians as among the pathologists as to what constitutes "angioid streaks." I should like to give a brief abstract of the clinical history of a typical case of angioid streaks of the retina observed over a period of 36 years. The case was reported before this Society in 1909, and was repeatedly shown over several years before the College of Physicians of Philadelphia. These are the fundi as painted at that time.

The patient, a man, aged 33 years, came to the Eye Clinic at St. Mary's Hospital in November, 1908, complaining of pain and dimness of vision in the right eye. This was due to a dendriform ulcer of the cornea. In the routine examination the angioid streaks in the retina were revealed. To summarize the findings: In the fundus of each eye there was a system of ramifying and anastomosing pigmented streaks which extended outward into the fundus from a similar band which surrounded crescents of grayish-yellow retinochoroidal disturbance about the disc. The streaks were beneath the retinal vessels and tapered toward the periphery of the fundus, which was the site of marked retinochoroidal changes. The color of the streaks was, in general, black, but in places there were islands of bright-red color. In O.D. there was a horizontally oval hemorrhage below the fovea.

In 1927, the patient was again shown at the College of Physicians and the following description of the media and fundi was given:



"O.D. Two vacuoles in upper part of lens, one large and one small. The disc yellowish gray and the nasal border veiled. The choroidal vessels in central area show varying degrees of sclerosis. There are several dense black pigment masses about 1 d.d. in size at the macula. The broken yellowed pigmented zone about the disc noted earlier has almost completely disappeared. There are still sections of fairly characteristic angioid streaks, following the course of the superior temporal vessels, near the equator below and one far out along the course of the superior nasal vessels. The latter is continued as a whitish streak running toward the disc. There is a black pigment mass lying beneath the superior nasal artery about 3 d.d. from the disc. Marked sclerosis of choroidal vessels was present. No active changes were noted.

"O.S. Media clear. Disc is about the same color as in the right eye. The veins are engorged. The sclerosis of choroidal circulation is more pronounced in the central area than in O.D. The pigment masses at the macula are also denser and larger than in the right eye. Of the pigment bands earlier seen, there remain only a section of one running horizontally a distance of about 3 d.d. near the equator, and one extending from upper margin of disc along the course of the superior temporal vessels. There is a greenish crescent about the nasal side edge of the disc bordered with a pigment band as originally seen.

"In both eyes, the periphery of fundus shows the pale yellowish dots and pigment originally noted.

"In both eyes the tension was normal.

"Vision: Right eye, 5/30. Left eye, 0.5/60."

In 1934, at the request of Dr. T. L. Terry, I had studies again made of the patient's physical condition to determine whether there was any evidence of Paget's disease. The roentgenograms were nega-

tive for evidence of Paget's disease, but there was some calcification in the region of the sella turica, probably within the internal carotid artery. At that time I again examined the patient's eyes. The description of the fundi showed that the changes noted in 1927 had progressed. There was no longer any evidence of the former angioid streaks and in the right eye there was an area beneath the superior temporal vessel suggestive of circinate retinitis.

The patient was seen again on May 18, 1944. O.D. There were a few vacuoles in the lens. The disc was somewhat waxy in appearance, but the gray zone which was formerly present about the disc has disappeared. Over most of the fundus there was a marked sclerosis of the choroidal vessels, with deep pigmentation of the intervacular spaces. In the macular region there were masses of dense pigment of irregular shape. In some portion of the fundus there was complete atrophy of the choroid.

O.S., media were clear. General appearance of the fundus about the same as in the right eye, only the areas of complete destruction of the choroid were most extensive and there was a denser massing of the pigment in the macular region. There were two extensive areas of almost complete atrophy, one along the course of the inferior nasal vessels and the second along the course of the inferior temporal vessels. Beneath the superior artery there was a vertical irregular area 3 d.d. in diameter, of whitish hue with a circinate appearance.

Vision: Right eye, 1/60. Left eye, 1/60.

About three months ago, the patient suffered a slight stroke affecting his speech and at the present has a systolic blood pressure of 210.

DR. F. P. CALHOUN, Atlanta, Ga.: In 1927, the late Thomas B. Holloway presented a paper before this Society on the subject of angioid streaks, and with his

characteristic thoroughness, reviewed the 56 cases then reported in the literature.

He noted that in four cases there was a familial tendency, and he commented that "if such an investigation had been made it is possible that the active coincidence would have been high."

At the same meeting I likewise presented "An unusual case of angioid streaks," and I pointed out that the family history of the patient strongly suggested a familial, vascular disease or degeneration, since one brother had died at an early age from a heart attack, a sister died of intestinal hemorrhage, and a living sister was reported having a bilateral central choroiditis, which, indeed, might have been an atrophy from a hemorrhage and not from an infection.

In 1938, Law reported a similar family history in connection with angioid streaks, one member dying of intestinal hemorrhage.

I now wish to present the very unusual and extensive pedigree of a family in which angioid streaks, skin lesions (which clinically resemble pseudoxanthoma elasticum), and distal hemorrhages were the dominant symptoms.

I am in agreement with Dr. Bedell that the fundus picture which is described as angioid streaks and its complications involving the macular region may be due to a variety of causes, one of which is a familial vascular degeneration. I know of no better way to explain it than to accept Hagedoorn's thesis.

DR. F. H. VERHOEFF, Boston, Mass.: I understand that Dr. Bedell concluded from his study that the condition known in the literature as angioid streaks is not an entity, but that the streaks may have various origins. Lindner pointed out that pigmented streaks can form over sclerotic choroidal vessels, and I demonstrated the nature of the pigmented streaks that sometimes result from separation of the

choroid. No doubt streaks may result from still other causes. Such streaks, however, do not produce the characteristic picture of the condition known as angioid streaks.

In 1928, when I reported the finding microscopically and macroscopically of many conspicuous streaks in the fundus of an enucleated eye, I felt sure that I had discovered the nature of angioid streaks, although none was present in the other eye. Up to that time, no microscopic examination of an eye with the typical ophthalmoscopic picture had been made, and my findings seemed to explain not only the streaks, but also the macular changes and the choroidal hemorrhages that sometimes occur.

The case, however, reported by Böck in 1938 has almost if not quite persuaded me that mine was not one of angioid streaks. Böck examined microscopically, *post mortem*, two eyes which had ophthalmoscopically shown typical angioid streaks. He not only failed to find choroidal ridges such as I had seen in my case, but did find in Bruch's membrane changes which seemed adequately to explain the streaks.

In 1939, Hagedoorn reported similar microscopic findings, but since the ophthalmoscopic examination was unsatisfactory his case is significant only when considered in connection with Böck's. Law, in 1938, concluded, after microscopic examination of an eye with angioid streaks, that the latter were due to retinal wrinkles. I feel sure that the findings he described were due to post-mortem changes.

Further examination of this eye should be made in the light of Böck's case. In Benedict's case, the eye, possibly on account of the way it was sectioned, showed neither choroidal ridges nor anything else that explained the streaks that had been seen ophthalmoscopically. The changes in Bruch's membrane found by Böck and

Hagedoorn were similar to, but generally more marked than, those I had often seen many years ago in senile eyes, and had described in collaboration with Dr. Sisson in 1926. The youngest patient in whose eyes we found them was aged 48 years. This fact is highly confusing because it suggests that angioid streaks should develop chiefly if not solely in senile eyes, whereas it is believed that they begin in early life even when they are first seen much later, for they have actually been observed in childhood. Other confusing facts are that, while many of the patients have pseudoxanthoma elasticum of the skin, a considerable number have well-marked Paget's disease of the bones, and that although a few have neither of these conditions, no case has been described in which the patient had both.

DR. RALPH I. LLOYD, Brooklyn, N. Y.: Rayner Batten has some very beautiful black-and-white and colored drawings of cases in a family seen over a period of years, but they do not compare with Dr. Bedell's stereoscopic kodachromes. One of the French authors has observed several members of a family over quite a period, but the illustrations are sketches and not well done. I will take your time just long enough to show the fundi of three sisters to emphasize the fact that there are many cases of macular degeneration seen, but, if there are no angioid stripes, we are at a loss for a definitive designation. One of these sisters has typical bilateral macular degeneration with angioid stripes; a second sister has all of this in one eye and the macular degeneration but no stripes in the other eye, and the third sister has only slight macular changes.

DR. BEDELL, closing: Dr. Clay who has seen many angioid streaks said that in 63 recent cases 30 percent were associated

with pseudoxanthoma elasticum. It is difficult for me to consider that the skin disease and the angioid streaks are anything more than coincidental changes.

He further reports that he has seen no streaks develop after the acute period has passed. You will recall that I showed how a streak developed and how it has continued to increase in both length and width.

I agree with Dr. Clay's observation that macular hemorrhages occur and that the end result of them is similar to disciform degeneration, but my interpretation is different. I consider the hemorrhages to be coincident with the angioid streaks and not part of the same disease, for I have seen hundreds of macular degenerations without streaks.

Dr. Zentmayer records the results of his careful observations of a patient for over 36 years. This is unique and worthy of critical examination, for the fundus changes were not only angioid streaks and choroidal-vessel sclerosis, but also hypertensive retinal disease.

Dr. Calhoun has made notable contributions to our knowledge of angioid streaks, especially in the field of familial vascular diseases, and if, eventually, the cause of the streaks is found to be a vascular degeneration, his contributions will rank high in the list of early investigations.

Dr. Verhoeff referred to his pathologic examinations, and it is satisfying to note that the changes in Bruch's membrane, ascribed by some as the cause of angioid streaks, were similar to and not more marked than he had often seen in senile eyes.

The drawings shown by Dr. Lloyd illustrated some of the confusing fundus changes.

It was gratifying to note the interest taken in the paper, and I thank those who have discussed it.

## DIABETIC IRIDOPATHY\*

C. A. CLAPP, M.D.

*Baltimore, Maryland*

Changes in the iris associated with diabetic conditions have been reported for many years. Some of these conditions are inflammatory whereas others are apparently not associated with inflammation. This latter group, I think, should be called iridopathy. Since they are apparently more frequent than the former and may even be confused with malignancy, I believe that a discussion of the changes and points in differential diagnosis may be helpful.

The noninflammatory changes in the iris were described by Parsons,<sup>1</sup> who stated that an extreme edema of the pigment layer of the iris with the formation of cystlike spaces occurred, as well as the freeing of pigment. Kamocki,<sup>2</sup> in 1887, found similar changes as illustrated in figure 1. It is evident that not only was the pigment epithelium of the iris edematous, with cystlike formations, but also there was an area of proliferation of the cells in the anterior capsule of the lens. Ball<sup>3</sup> also illustrated (fig. 2) the condition of edema and cystic formations in the pigment-epithelial layer and called attention to the occurrence of free pigment in the aqueous in cases of cataract extraction so that the aqueous appeared even black in color. Roemer and Foster<sup>4</sup> referred to the pigment layer as being swollen and the pigment often scattered over large spaces.

Zentmayer,<sup>5</sup> in 1913, reported a case of cataract extraction in a diabetic wherein

a cast of the posterior pigmented surface came away. Duke-Elder<sup>6</sup> mentions softening of the posterior layer of the iris and an infiltration of the tissues with glycogen and rarely a lipemia. The infiltration of glycogen into the nerve fibers of the iris was demonstrated by Hoffman,<sup>7</sup> in 1914. Moore<sup>8</sup> found only one case of iritis in 62 cases of diabetes, but he states that marked changes in the epithelium of the posterior surface of the iris are almost constantly present and that thickening of the stroma may occur.

In 1935, Waite and Beetham<sup>9</sup> reported their findings in 2,002 diabetic patients and by comparison in 457 nondiabetic ones. They found evidences of depigmentation of the iris in 6 percent of the diabetics and in only 2 percent of the nondiabetics, with pigment deposits on the posterior surface of the cornea in 11.5 percent of the diabetics and in 5 percent of the nondiabetics, with about the same proportion of cases of pigment deposits on the anterior surface of the lens, 2.8 percent: 1.8 percent. The authors suggest that this disturbance of the pigment in the iris may be due to the storage of glycogen in the tissues.

Leopold,<sup>10</sup> in a recent article on ocular findings in diabetes which had been controlled for a period of 10 years, states that treatment had no effect on motility of ocular pigment and that iritis was not influenced by treatment. No case of rubeosis diabetica iridis was seen in the 100 cases reported. He also stated that depigmentation occurred in the older-age group of patients. In his last treatise on the eye, Tassman<sup>11</sup> states that the most frequent change is edema and swelling of the pigment epithelium with liberation of

\*From the Wilmer Ophthalmological Institute of the Johns Hopkins Hospital and the Johns Hopkins University School of Medicine. Presented at the eightieth annual meeting of the American Ophthalmological Society, at Hot Springs, Virginia, June, 1944.



Fig. 1 (Clapp). Changes in the pigmented layer of the iris in diabetes (Kamocki<sup>2</sup>).

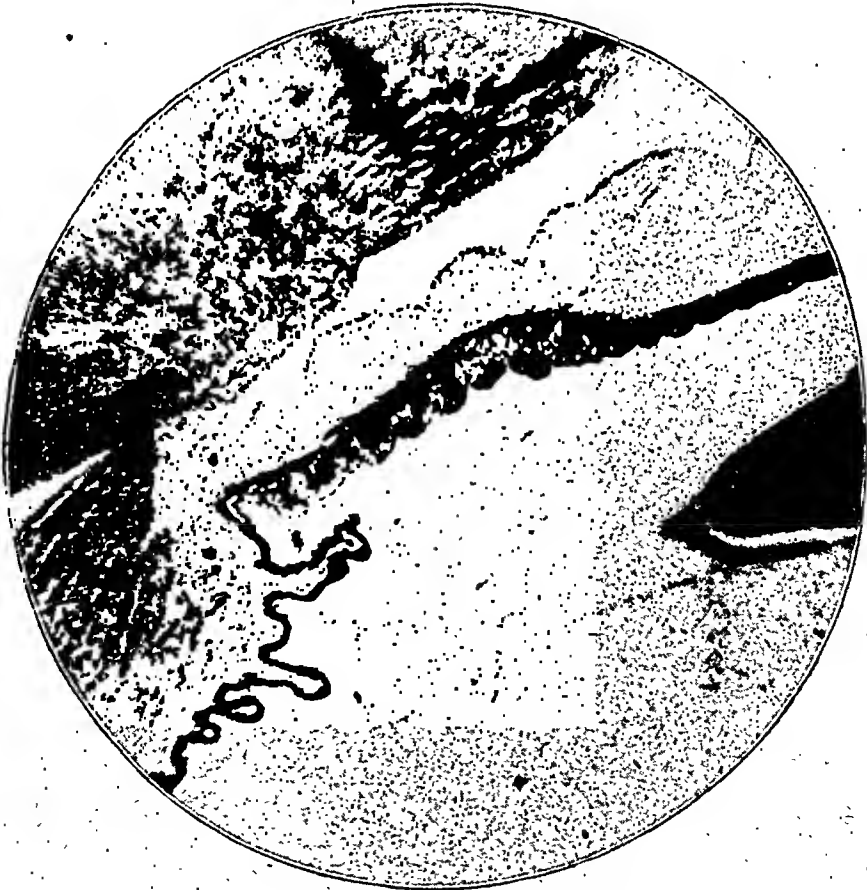


Fig. 2 (Clapp). Proliferated pigment epithelial layer with edema (Ball<sup>3</sup>).

free pigment. The stroma may become atrophic.

Villani,<sup>12</sup> in 1934, was able to demonstrate in experimental diabetes in animals, edema, thickening, and some vacuoles in the epithelial layer of the iris and ciliary body, but the changes seem more marked in the iris.

Practically all of the pathologic mate-

is again seen the thickening of the pigmented epithelial layer with numerous vacuoles present. This patient also had an acute attack of glaucoma with tension of 85 mm. Hg.

In the case represented by figure 5 is seen a marked thickening of the pigmented area with vacuoles, especially at the pupillary margin, but also some ec-



Fig. 3 (Clapp). Photomicrograph of the iris showing thickening of epithelial layer with large vacuoles in a white woman, aged 34 years, who had severe diabetes, with secondary glaucoma.

rial in my hands available for study showed marked changes in the pigment-epithelial layer, but many of the eyes were removed because of a painful glaucoma so that it is difficult to evaluate as to whether the changes were all due to the diabetes or partially due to the secondary complications.

In figure 3 the section shows marked swelling, edema, and the presence of vacuoles in the pigment layer. There are also dilated vessels in the stroma suggesting iritis rubeola. This eye was removed from a young woman aged 34 years, and it was in a state of secondary glaucoma with a tension of 70 mm. Hg.

In figure 4, a photomicrograph of the iris in a white woman aged 66 years, with a history of diabetes for 20 years, there

tropion uveae. This patient also had glaucoma following occlusion of the central retinal vein.

Figure 6 is a photomicrograph of the iris of a doctor who showed iritis rubeola and later developed glaucoma. This section presents an apparent dissociation of the pigment epithelium and a migration of the retinal pigment, a considerable portion being deposited upon the anterior capsule of the lens and some apparently migrating into the stroma of the iris. It is difficult in a case of this kind to determine how much of the change should be attributed to iritis and how much if any to iridopathy.

In figure 7, fortunately, there is a section of a diabetic eye from a patient who did not have glaucoma but who died of



Fig. 4 (Clapp). Photomicrograph of an iris showing numerous vacuoles and thickening of epithelial layer. This patient also had increased ocular tension.



Fig. 5 (Clapp). Photomicrograph of the iris showing ectropion uveae with thickening and vacuole formation of the pigmented epithelial layer.

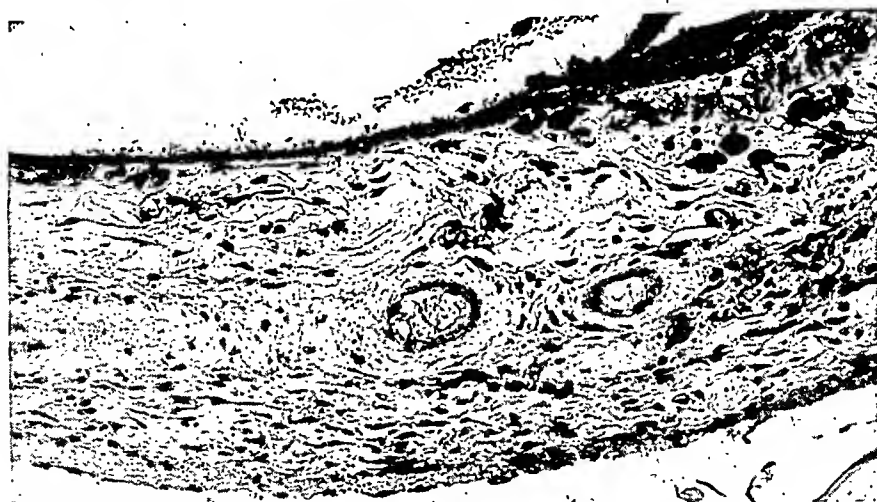


Fig. 6 (Clapp). Iritis rubeola, with new-formed vessels in iris, with dissociation of pigment-epithelial layer and migration of pigment.

pneumonia, so that these changes are apparently not secondary to glaucoma. Note here the marked thickness of the pigmented epithelial layer with the edema and vacuole-like formations. This represents, I believe, a rather typical change in the pigment layer in many cases of diabetes of several years' duration.

In view of these changes in edema, dissociation, and pigment migration as

years she had noticed a change of color taking place in her left eye. She called the attention of her family doctor to the condition and he advised seeing an ophthalmologist. This she did, with disturbing results, for he gave the opinion that she had a malignant melanoma of the iris and advised immediate enucleation. She then consulted a second ophthalmologist, who diagnosed a melanoma but thought it was

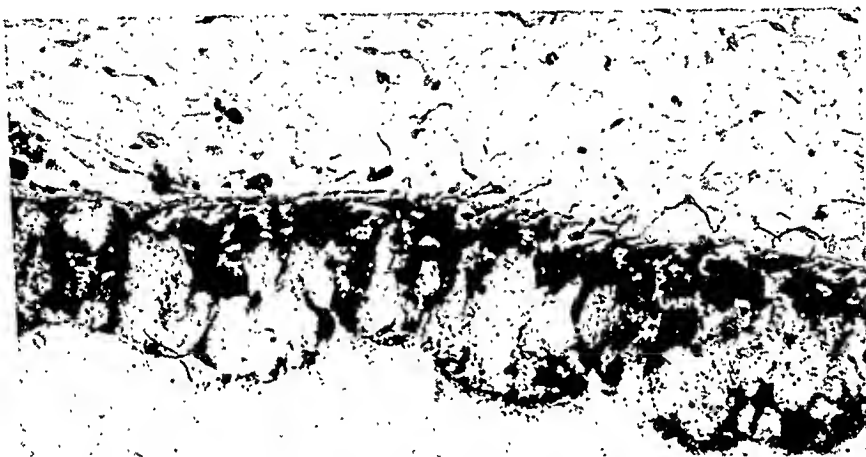


Fig. 7 (Clapp). Photomicrograph of a diabetic's iris, the patient having succumbed to pneumonia. The marked thickening with cystlike areas seems to be quite characteristic of the condition.

seen in the photomicrographs of the iris, I believe that one can explain the changes as seen in the following clinical cases.

#### CASE REPORTS

*Case 1.* Mrs. K. W., aged 49 years, was first seen in May, 1942. She had been under treatment with insulin for 20 years and was probably the first United States citizen to receive this type of treatment. She was sent to Dr. Banting in October, 1922, and was at first informed that she would have to become a Canadian citizen before getting insulin. After a short time this requirement was waived, and she was treated by Dr. Banting and has been using the insulin ever since. Her eye history was that her vision was good except for near work, for which she used glasses. For two or three

nonmalignant. Her consultation with me was made in order to secure another opinion.

The external examination showed the right eye to be normal in all respects, but ophthalmoscopically there was found a small hemorrhage near the macula. The left eye externally showed the pupil to be elliptical in form (see fig. 8), the long diameter being from the 2- to the 7-o'clock position 5 mm., whereas it was  $4\frac{1}{2}$  mm. in the opposite axis. The pupil reacted actively except down and in, where there was only a slight action. In this lower nasal quadrant was a dark pigmented area extending from the 6-o'clock up to the 9-o'clock position. The pupillary involvement did not include quite so large an arc as the periphery. At both the upper and lower margins was a definite thicken-



ing of the iris, whereas in the central area there was a definite atrophy with iris vessels showing in this region. A slight ectropion uveae was present at the lower margin of the pupil. Ophthalmoscopically there was a small round hemorrhage below the macula. In spite of the slight retinopathy, vision with correction was 20/16 in each eye.

Although there was thickening of the iris at the upper and lower margins of the pigmented area, I felt sure, in view of

of the right eye also showed a pigmented area in the lower temporal quadrant. This area was small and did not have the atrophic center, but did have an elevated area at the temporal margin. This condition might even be a congenital heterochromia iridis, as neither the patient nor her family had ever noticed a change in the color of the iris. She had serious intraocular lesions in the form of a few lenticular opacities, right and left, and a large hemorrhage in the vitreous of the



Fig. 8 (Clapp). A photograph of the left eye of a patient showing a melanotic area. The iris was thickened at the junction of the normal-colored iris and the melanotic portion. In the central area there was atrophy, with thinning and loss of mobility.

the atrophic condition in the central portion, that this could not be a malignant manifestation, and therefore advised continued observation. Subsequent examinations on May 14, 1942, and January, 1943, as seen by the transparencies, showed no change, so that I believe we were safe in assuming it was not a malignant growth nor even a precancerous condition.

*Case 2.* E. F., a woman aged 55 years, was seen on July 25, 1942, with a history of having had diabetes for five years. Her complaint was failing vision. External examination showed both pupils reacting to light and accommodation, but the iris

right eye, with a detachment of the retina. The fundus of the left eye showed marked vascular changes. Vision with correction was: O.D. 5/200; O.S. 20/70. This patient lived in the country and was not seen after the initial visit nor were communications answered, so that the final result cannot be reported.

#### COMMENTS

If there occur pigment changes, whether due to toxic conditions or to diabetes, as Duke-Elder suggests, then the changes seen in Mrs. K. W. are explained. I have referred to statements and illustrations by Parsons, Kamocki, Ball, Roemer and Foster, Zentmayer, Duke-Elder, Leopold,

Foster Moore, Tassman, Hoffman, and Waite and Beetham, in which all seem to agree that the pigment layer often shows edema and the presence of vacuoles with some atrophy and depigmentation. What apparently takes place is that the pigment is liberated from the epithelial cells, on their death, and the stroma cells, by a phagocytic action take up the freed pigment, thus causing the changes noted. Since this change is probably either metabolic or nutritional and not inflammatory, the term iridopathy would seem to be more appropriate than iritis, just as retinopathy is a better term than retinitis in a noninflammatory lesion. It is most important to keep this condition in mind and not be too hasty in advising immediate enucleation.

One may also speculate as to the cause of these changes in the pigment layer of the iris. They may be the result of foci of infection, which are known to be prevalent in cases of diabetes, but if so, why are not cases of focal infection other than

the diabetic seen when these changes occur? If due primarily to the diabetes, what factor plays the role in producing the changes? While storage of glycogen in the cells may tend to liberate the pigment, no proof of this has been forthcoming. Possibly some yet undiscovered chemical may be the etiologic factor.

#### CONCLUSIONS

1. Iridopathy is a term to be used when changes in the iris occur that are of metabolic not inflammatory origin.

2. Diabetes may cause changes in the iris that may be confused with malignant melanoma.

3. Clinical and pathologic observations have apparently been confirmed by animal experimentation.

4. A further study of these changes is desirable, especially to ascertain whether they are limited chiefly to the diabetic, and also their possible cause.

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# ONCHOCERCIASIS

## A STUDY OF OCULAR COMPLICATIONS IN 342 AFRICAN CASES

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Glasgow

Since Robles (1916) first described eye changes in onchocerciasis, many observations have been recorded.

The purpose of this paper is to present the incidence of ocular complications in a series of cases examined in West Africa, and to discuss the cause of such complications. The paper is divided into four parts, as follows: I. Summary of the literature. II. Author's cases. III. Discussion and Summary. IV. Appendix A, Distribution of *O. volvulus*; Appendix B, Identification of microfilariae seen in aqueous (50 cases).

### PART I

#### DEFINITION

Strong, the editor of "Stitt's tropical diseases," who has led expeditions in Liberia, in the Belgian Congo, and in Guatemala to study the disease, defines it thus:<sup>88</sup> "The term onchocerciasis implies a parasitic infection with the nematode *Onchocerca volvulus*, in which the most characteristic clinical manifestation is the occurrence of subcutaneous nodules or tumours.

"In certain individuals who apparently show special sensitiveness to the presence of parasites, to the action of their toxins, to products of metabolism, or to disintegration, secondary disturbances of the skin and eyes may occur."

#### GEOGRAPHICAL DISTRIBUTION

Onchocerciasis is found in Africa and in America. In the latter it occurs in Guatemala and in Mexico. In Africa it has been reported in almost every colony in West and East Africa (*vide* Appendix A).

Brumpt<sup>10</sup> named the American worm *Onchocerca caccutiens*, but this is now taken to be synonymous with *O. volvulus* (Sandground<sup>90</sup>).

#### MODE OF INFECTION

The cycle of infection has been worked out by Blacklock<sup>6</sup> and by others.<sup>4,8,26-28,35,39,60,90</sup> During the day a female fly of the *Simulium* genus bites an infected human or animal (for example, cland or buffalo). The act of biting appears to attract microfilariae (M.f.) which are ingested by the *Simulium*. The M.f. undergo development while making their way from the stomach to the thoracic muscles and proboscis of the fly. The M.f. are now in a pre-adult stage and the fly, when biting the skin, is capable of infecting a new host. In the new host the worms grow to full-sized adult males and females. The female produces large numbers of motile M.f. which are found in the dermis; in the conjunctiva, and in other tissues of the eye, but not in the blood. A detailed description of the filariae and the M.f. is given by Strong.<sup>88</sup>

#### RESULTS OF INFECTION

These are A, Nodules. B, Skin changes. C, Eye changes.

A. NODULES. When the adult worms have developed, several tend to become intertwined and encased in a nodule with a fibrous capsule. M.f. penetrate the fibrous capsule and escape to the dermis. Nodules are found in the subcutaneous tissues—95 percent on the trunk in Africa and 95 percent on the head in America. The nodules have been studied histo-

logically<sup>5,10-12,48,53,67,88-91</sup> and little inflammatory reaction is found. Low<sup>48</sup> suggests that encapsulation is nature's cure.

B. SKIN CHANGES are (a) Lichenification; (b) Itch or crawl-crawl; (c) Elephantiasis.

Robles described "erisipela de la costa," but other workers<sup>6,24,25,40,41,60,61,69,70,74-77,81</sup> find a lichenification of the skin, particularly over the buttocks. This gives rise to an itch or crawl-crawl, which is believed to be a manifestation of allergy and not directly due to the presence of

Strong<sup>87-91</sup> in Africa and America. The eye changes described are as follows: (a) Punctate keratitis; (b) vascular keratitis; (c) low-grade iridocyclitis; (d) choroiditis; (e) retrobulbar neuritis and optic atrophy; (f) visible microfilariae in the cornea, aqueous, and vitreous. Such changes rarely lead to blindness under 30 years of age, but there is considerable difference of opinion as to the frequency of such complications and as to their severity, as can be seen from the following table.

TABLE 1  
INCIDENCE OF EYE CHANGES

Place	Author	Eye Changes percent	Blindness percent
Mexico	Larumbe Mühlens	20 10-20	2.5 —
Guatemala	Calderon Strong Mira, Diaz and Estevez	100 5 34.8	— — 15
Belgian Congo	d'Hooghe Hissette in Sankuru in Lomani in Ilebo in Tangin Lonkala in Katanga Strong	2.1 50 50 43 51 50	0.4 — — 10 27 (adults) 20 "most striking phenomenon"
Cameroons	Turner Scott	— 30.3	1.04 Medical census Less than 0.3 —from all causes

microfilariae. Elephantiasis has been found in some cases and hydrocele in others.

C. EYE CHANGES. Ocular complications were first described in Guatemala by Robles,<sup>73,73a</sup> Calderon,<sup>14,15</sup> and Luna.<sup>49-51</sup> They described a characteristic form of punctate keratitis and iridocyclitis, and believed that removal of the nodules cured the ocular complications. Subsequent work has been done by many workers,<sup>2,12,18,20,22,23,24,39,41,45,46,58,59,72</sup> and in particular by Hissette<sup>33-38</sup> in Africa, Torroello,<sup>92</sup> and Silva<sup>85,86</sup> in Mexico, and by

In discussing blindness some authors stress the importance of keratitis, some indict occlusion of the pupil, and others name choroiditis or optic atrophy as the chief cause.

It is generally stated that nodules on the head are more likely to produce eye changes than are nodules elsewhere, but this is not supported by table 1, when it is remembered that head nodules occur in 5 percent of cases in Africa and in 95 percent in America. In recent years cases of ocular onchocerciasis have been reported in Europeans.<sup>1,2,40,42,47,66,80</sup>

*Cause of ocular complications.* Earlier workers agreed that the cause of ocular complications was a filarial toxin. After the discovery of (1) M.f. in all parts of enucleated blind eyes and of (2) M.f. in the cornea, aqueous, and vitreous of affected eyes by slitlamp examination, Mexican workers<sup>86</sup> claimed that the main cause was the presence of M.f. in the eye. Hissette<sup>35</sup> supported this view, stressing the importance of dead M.f., but recently Strong<sup>68</sup> stated that both factors were probably involved.

*Treatment and Eradication.* The ocular complications respond well to local treatment but eradication of the disease is not easy. As control of fly breeding is difficult, eradication of the disease is dependent on clearing human reservoirs of infection. Mass removal of nodules has been practiced in Mexico and in Guatemala with considerable success.<sup>88</sup> Other workers<sup>22,44,64,81,84,90,92,94,98</sup> have studied the effect of drugs, of which antimony and foudadin are the most promising.

## PART 2

### AUTHOR'S CASES

Three hundred and forty-two Cameroon soldiers were examined for nodules, for skin changes, for ocular complications, and some for microfilariae in the skin and in the blood.

With few exceptions the patients were under 30 years of age, and almost all were found to be infested with onchocerciasis.

A similar examination of 300 Gambian soldiers, in whom onchocerciasis is rare, served as a comparison.

The ocular complications in 38 hospital cases will also be mentioned.

### NODULES

The firm, movable, subcutaneous nodules of *Onchocerca volvulus* vary in size

from a small pea to a walnut, but there is a characteristic feel about them which experience quickly teaches. Nodules were found on 38.6 percent (standard deviation 2.8) of Cameroons and on 2 percent (s.d. 0.8) of Gambians. The diagnosis was confirmed by skin snip or by puncture of the nodule in 30 Cameroons and in 6 Gambians. The nodules varied from 1 to 5 in different cases, and were found under the skin in the following situations: Iliac crest, 44 percent; femoral trochanter, 39 percent; intercostal spaces, 16 percent; knee, 13 percent; elbow, 4 percent; head, 0; other sites, 4 percent. It should be noted that 83 percent of the nodules were around the hip and that none were on the head.

### NO NODULES

It is recognized that a proportion of cases occur in which there are no nodules; for example, Strong found 5 percent, Blacklock 40 percent, and Sharp 45 percent nodule free.

The supposition that adult worms can lie free (as with *O. gibsoni* in cattle) has been proved by Van den Berghe<sup>95</sup> who found two such filariae at *post mortem*, thus corroborating an earlier report by Sharp.<sup>83</sup>

In this series, 124, or 38.6 percent, of the Cameroons had nodules and 218, or 61.4 percent, had no nodules. Fifty of the cases without nodules were examined by taking a skin snip from the right hip. M.f. were found in 49 of the 50 cases. It is assumed that this proportion is substantially correct for the remainder of the cases without nodules. For the purpose of this paper 100 percent infestation among the Cameroon cases is assumed.

In the 300 Gambians, 6, or 2 percent, had nodules and 294, or 98 percent, had no nodules. M.f. were found in a skin snip in 2 of 30 cases without nodules. For the purpose of this paper, the very

approximate figure of 5 percent is taken to indicate infestation among the Gambians. (Further work was done in examining 300 Nigerian soldiers, when it was found that 15 percent [s.d. 2] had nodules and that 15 out of 30 cases without nodules gave a positive skin snip.)

#### SKIN CHANGES

Lichenification, or dry scaly skin over the buttocks, was noted in 1 percent of the Gambians, and in 5 percent of the Cameroons. Only a few complained of itch, although many had had it in the past.

No figures were kept, but a number of Cameroons had a thickening of the scrotum which suggested early elephantiasis rather than the change seen in avitaminosis.<sup>62</sup> *Wuchereria bancrofti* (the usual cause of elephantiasis) is very rare in the Cameroons (Appx. B). Hydrocele was seen in three cases.

#### OCULAR COMPLICATIONS

Three hundred and forty-three Cameroonian patients and 100 Gambians were examined by slitlamp microscope ( $\times 20$ ) and by ophthalmoscope, their pupils having been dilated. The findings in the Cameroon cases and in 38 hospital cases are grouped under the following headings:

- (1) *Microfilariae*
  - (a) in the cornea
  - (b) in the anterior chamber
  - (c) in the lens
  - (d) in the vitreous
- (2) Punctate keratitis
- (3) Iridocyclitis
- (4) Chorioretinitis
- (5) Optic neuritis

#### *Microfilariae*

a. *In the cornea.* In only a few cases was there evidence of microfilariae in the

cornea. In these few cases an immobile white line probably represented a dead M.f. Only one live M.f. was seen in the cornea, whence it disappeared in 24 hours, leaving no reaction.

b. *In the anterior chamber.* In the anterior chamber M.f. were common. By slitlamp 31, or 9 percent, of the Cameroons had unmistakable, easily seen, live M.f. constantly lashing, wriggling, tying and untying themselves in the aqueous. M.f. could also be seen with the binocular loupe. No patient complained of entoptic disturbance.

The M.f. moved around with the aqueous circulation and were unaffected by the beam of light. An average circuit took 60 seconds. A single M.f. often dropped out of sight after two or three circuits. When many M.f. were present, the circulation was noticeably slower and individual M.f. could be seen in the same position for 30, or more, seconds at a time. There was no evidence of phototaxis.

M.f. were more common in the eyes of patients with nodules than in those without nodules. The number seen varied from 1 to 50 in different cases, but 2 or 3 were the average.

In cases with few M.f. the numbers altered in an irregular fashion from hour to hour.

One patient examined 3-hourly during the day and 6-hourly at night for 36 hours gave the following numbers of M.f. in the aqueous:

R.	2.	1.	2.	1.	4.	1.	1.	3.	3.	0.	2.	1.	4.
L.	0.	1.	0.	0.	1.	1.	0.	2.	2.	2.	0.	1.	1.

The same patient was seen six times at monthly intervals and 2 or 3 M.f. could always be found.

Cases in which there were larger numbers—for example, over 10—showed greater variation. In one case M.f. were too numerous to count one day. An estimate of 70 in one eye and 50 in the other

was made. The following day, the numbers were 12 and 15, respectively. No dead M.f. were ever seen in the aqueous. Three cases in which there were many M.f. were examined at frequent intervals over a period of six months, and no diurnal or lunar influence was noted.

Despite the irregular variation in numbers, it is felt that the presence and numbers of M.f. in the aqueous could serve as a guide to the success of any attempt to eradicate the disease. (Knowledge of the longevity of M.f. would supplement the usefulness of this test.)

c. *In the lens.* In two cases, one end of a M.f. had become engaged in the anterior capsule. In one case seen daily the M.f. died after 24 days, but the other was still alive after 2 months. The dead one was clearly visible four months later, but was barely visible after eight months. In neither case was there any reaction in the eye or in the lens.

d. *In the vitreous.* Microfilariae were found to be uncommon in the vitreous, the slitlamp and the +40-lens method of Estrada<sup>23</sup> being used.

*The identification of M.f. is described in Appendix B.* All were found to be M.f. *O. vulvulus*.

### *Punctate keratitis*

It was seen in the hospital cases that the first corneal change was a small circular opacity, composed of numerous fine yellow dots, at any level in the substantia propria, accompanied by photophobia and conjunctival hyperemia. Such opacities might fade away or enlarge. If they enlarged, the yellow color turned to gray or white, and these gray nebulae, which grew sometimes to be 0.5 or 1.0 mm. in diameter, were a common corneal finding. They were found equally in all areas of the cornea. Similar gray nebulae have been noted in trachoma, and rarely in other forms of keratitis. Lesions of the

corneal epithelium were not included. No case of vascularization of the cornea was seen except in trachoma and in pterygium, which are not uncommon.

The following table compares the incidence of onchocerciasis with punctate keratitis:

	100 Gambians percent	342 Cameroons percent
Onchocerciasis	5.0	100.0
Punctate keratitis	5.0	25.7

Allowing for the fact that 10 percent of Gambians and 2 percent of Cameroons have trachoma (which may account for some of the corneal lesions), it is seen that punctate keratitis increases directly with, and is presumably caused by, onchocercal infestation.

In the few cases when corneal M.f. were seen, they were not in or near the nebulae, although Hissette considers that the nebulae or puncta are local reactions to dead M.f. Follow-up of such cases did not show the development of puncta round the M.f.

Thirty-one of 342 Cameroons had M.f. in the aqueous; 16 of these had no eye changes other than the presence of M.f. In some of the 15 cases with eye changes, the nebulae were only in one eye and not always in the eye presenting the M.f. In none of the 31 cases was the eye inflamed. It is concluded that punctate keratitis is not directly caused by the presence of M.f. in the cornea or in the aqueous.

Punctate keratitis was as common in Cameroons without nodules as in cases with nodules. (It was this unexpected finding which led to the investigation of skin snips in cases without nodules, when it was found that many cases without palpable nodules are infected.)

### *Iridocyclitis*

A deposit of fine dots of pigment on the posterior corneal surface was found in 27, or 7.9 percent, of Cameroons, all

of whom had punctate keratitis. It was seen to develop in hospital cases accompanied by photophobia, lacrimation, and ciliary flush. The pigment had a remarkable tendency to clear, leaving only one or two isolated spots. The pigment K.P. had no resemblance to "Mutton-fat drops." Synechiae or irregular pupils were rare. The combination of deep nebulae and pigment K.P. is very suggestive of onchocerciasis.

### *Chorioretinitis*

In no case in the series was there evidence of chorioretinitis, and only one hospital patient, who also had syphilis, had choroiditis.

### *Optic neuritis*

Vision in the 342 Cameroons was very good. Ninety-six percent had vision of 6/6 or better, in each eye. None of the remaining 4 percent had choroiditis or optic atrophy, and in less than 1 percent was the impairment of vision related to onchocercal changes.

However, retrobulbar neuritis was not uncommon among the hospital cases and two cases of optic atrophy were seen. These cases are described in the following section:

### HOSPITAL CASES

Thirty-eight cases of ocular onchocerciasis were admitted to hospital. The majority of these patients were Cameroons, but Gambians, Gold Coast, and Nigerians were also treated. The presenting signs were as follows: Keratitis, 9; iridocyclitis, 10; retrobulbar neuritis, 6; optic atrophy, 2.

The remainder were admitted for investigation and had no complaint. Keratitis and iridocyclitis were frequently associated. The findings in the 38 patients, all of whom had M.f. in the skin, were as follows: Nebulae, 36 (including 10 yellow nebulae); M.f. in cornea, 5; Pig-

ment K.P., 23; M.f. in the aqueous, 22; Nodules in the skin, 12.

Punctate keratitis and iridocyclitis have already been described and respond well to local treatment with heat and atropine. Although heat had a tendency to increase the number of M.f. in the anterior chamber, no adverse effect resulted.

### *Retrobulbar neuritis*

In the six cases of unilateral retrobulbar neuritis, the onset was sudden. No sign of avitaminosis was noted. In four cases, complete recovery took place in three weeks. In the fifth case papilledema developed a few days later. In this case, recovery was delayed for two months, and although vision returned to 6/5, a relative pallor of the disc was noted eight months later when vision was 6/6. In the sixth case, no recovery of vision took place in two months, but in three months, vision improved from 4/60 to 6/24.

In all cases, the onset was associated with slight pain, lacrimation, and a mild ciliary flush. In three cases there was an associated edema of the upper eyelid, with some proptosis in two cases which have been fully described elsewhere.<sup>79</sup> It was concluded that the cause was an anaphylactic edema of the orbit and nerve due to the toxins of an adult worm.

### *Optic atrophy*

One case of optic atrophy occurred in a Cameroon soldier aged 23 years. He had enjoyed good health and good sight until six months before his admission to hospital with hydrocele.

He mentioned his failing sight after operation. Bilateral optic atrophy was found with vision of 6/18 R. and L. No other eye change was noted. Kahn, C.S.F., X-ray, and general examination showed no abnormality. He had not had any course of injections (for example,



arsenic). He knew of no other case in his family. No nodules were palpable, but M.f. (*O. volvulus*) were found in skin snip. As M.f. are found in nearly all Cameroon skins, great importance cannot be attached to this finding.

The other patient, aged 29 years, gave a similar history. Kahn, C.S.F., X-ray, and general examination showed no abnormality. Each eye had one corneal nebula, and both discs were atrophic, with no other fundus change. Vision was R.E. 3/60, L.E. 6/36. He had *O. volvulus* nodules over the left hip. In the absence of any other discoverable cause, onchocerciasis must be considered.

#### TREATMENT

The eye conditions responded well to local treatment.

The average stay in hospital was three weeks. Various measures were tried to eradicate the disease. In cases presenting M.f. in the anterior chamber, the number counted one and four months after treatment was taken as a guide to the result.

(1) Excision of all nodules—3 cases. No improvement resulted.

(2) Course of 16 intramuscular injections of Stibophen, 5 c.c.—1 case. Slight improvement resulted.

(3) Course of 10 intravenous injections of Novarseno benzol 0.6 gm.—2 cases. No improvement resulted.

(4) Course of 5 intravenous injections of 10 c.c. 1-percent methylene blue—2 cases. No improvement resulted.

(5) Atropine and cocaine had no effect on the movements or numbers of microfilariae in the aqueous.

#### PART III

#### DISCUSSION

##### CAUSE OF COMPLICATIONS

In the definition of Onchocerciasis, the following were given as causes of skin

and eye disturbances in certain sensitive individuals: 1. Presence of parasites. 2. Products of disintegration. 3. Action of toxins. 4. Products of metabolism.

Each cause must be considered first in respect of filariae and secondly in respect of microfilariae.

#### Filariae

*Cause 1. Presence of parasites.* The parasites are well tolerated by the host. Encapsulation of worms may be a reaction to irritation, but histologic studies of nodules show little inflammation in the subcutaneous tissues. As the filariae are very rarely found in the eye, one concludes that the presence of filariae is not a cause of eye changes. (Wilson<sup>97</sup> and Silva<sup>50</sup> have both reported an unconfirmed case of a filaria in the eye.)

*Cause 2. Products of disintegration* are not a cause, for no eye changes have been reported following injection and destruction of nodules on a large scale.<sup>20,50</sup>

*Causes 3 and 4. Action of toxins and products of metabolism.* These will be considered together under the heading of "toxic causes." It follows that if neither the presence nor the disintegration of filariae causes a reaction, the eye changes are most probably due to a toxin, whether it be a product of metabolism or a secretion.

#### Microfilariae

*Cause 1. Presence of parasites.* M.f. are present both in the dermis and sometimes in the eye. Their presence is well borne, as has been seen in previous paragraphs, when M.f. in the cornea, in the aqueous, and in the lens have been described in eyes free from inflammation for many months. Furthermore, inflamed eyes become quiet despite the presence of M.f. It is concluded that the presence of M.f. in the eye is not a cause of ocular complications.

*Cause 2. Products of disintegration* are unlikely to be a cause in view of the lack of reaction when one M.f. in the lens was seen to die and later to be absorbed; in view of the lack of reaction around dead M.f. in the cornea; and in view of the absence of dead M.f. in the aqueous in inflamed eyes. This is supported by Torroella's<sup>82</sup> experiment of killing M.f. by the injection of 1:1,000 plasmochin into the aqueous without reaction.

*Causes 3 and 4. Toxic causes.* The action of microfilarial toxins is difficult to assess. One might conclude that microfilarial toxin is not a potent cause as M.f. are so well borne in the eye, but one must also consider the thousands of M.f. in the dermis, each of which may add toxin to the circulation.

The possibility that each M.f. may produce a trace of toxin is difficult to exclude. It has been noted that in cases with M.f. in the eye a greater proportion than average have corneal changes, that in inflamed eyes there is a higher proportion showing M.f. than the average, and that the aqueous circulation is slower in cases with numerous M.f.

Further work requires to be done to establish the significance of these points. Meanwhile two conclusions are drawn: (1) That the cause of the eye changes is a toxin (probably filarial, possibly also microfilarial); (2) that, as microfilariae are produced by filariae, the primary source of the toxin is the adult worm.

#### TREATMENT AND ERADICATION

It follows from the last conclusion that, apart from local treatment of the eye, the aim is to remove or destroy filariae. It has been shown that many cases occur without palpable nodules and it is assumed that nonencapsulated worms are present in such cases.

There is no reason to suppose that non-encapsulated worms may not also be pres-

ent in cases with nodules, which would explain why, in the absence of reinfection, fresh cysts appeared 1½ years after the removal of nodules.<sup>88</sup> It follows that the attack must be directed to destroying the nonencapsulated adult *Onchocerca volvulus* and that research must be directed to the discovery of a drug that will achieve this purpose.

The common occurrence of nonencapsulated filariae will not be proved until the work of Van den Berghe<sup>85</sup> has been repeatedly confirmed, and it is suggested that the subcutaneous tissue around the ilium is a favorable site to search for unencapsulated *Onchocerca volvulus* at *post mortem* in West Africa, and around the head in America.

#### SPECULATION

In an area where Simuliidae carry infection, babies do not escape being bitten and infected. The pre-adult worms may take some months or even years to mature, but then one expects them to produce M.f. As nodules are stated to be uncommon in children, one anticipates that the nonencapsulated filariae are proportionately common. Proof of this would be the common finding of M.f. in skin snips from children without nodules in an infected area.

#### SUMMARY AND CONCLUSIONS

1. The ocular complications found in 342 Cameroon soldiers (in whom 100-percent infestation with onchocerciasis was assumed) were as follows:

	Cases	Percent
(a) Punctate keratitis .....	61	17.8*
(b) Punctate keratitis with iridocyclitis .....	27	7.9*
(c) M.f. (microfilariae) in the aqueous of otherwise unaffected eyes .....	16	4.6
Total .....	104	30.3

\* 15 also had M.f. in the aqueous

2. Further complications were found in 38 hospital cases:

- (a) Retrobulbar neuritis .....rare
- (b) Optic atrophy .....very rare
- (c) Choroiditis .....exceptional

3. M.f. O. volvulus was the most common (if not the only) M.f. to enter the anterior chamber. Its presence was well tolerated.

4. The cause of complications was a toxin (probably filarial, possibly micro-filarial).

5. The common occurrence of nonen-capsulated filariae (O. volvulus) is postu-lated.

#### PART IV

#### APPENDIX A

Onchocerciasis has been reported in the following places. The approximate rates of infection are given where avail-able.

<i>West Africa Place</i>	<i>Author</i>	<i>Per- centage</i>
Senegal	Clapier	
	Montpellier and Lacroix	
Gambia	Scott.....	5
French Guinea	Laigret	
	Clapier.....	11
French Sudan	Laigret.....	5
Sierra Leone	Blacklock.....	45
Liberia	Strong	
Ivory Coast	Laigret	
	Joyeux, Sedan and Es- menard	
Gold Coast	Corson.....	6
	Macfie and Corson....	34
Dahomey } French Niger } Nigeria	Montpellier and Lacroix	
	Sharp.....	55
	Best	
	Scott.....	50
Carmeroons	Fulleborn	
	Sharp.....	95
	Scott.....	98
French Equa- torial Africa	Ouzilleau	
Belgian Congo	Ouzilleau et al.	
	Brumpt.....	50
	Rodhain.....	50
	Rodhain et al.....	50-60
	Dubois.....	60
	Hissette.....	73
	Strong, Hissette et al..	100
	Blanchard and Laigret	
	d'Hooghe.....	88
	l'Ouelle.....	5
	Rafai.....	50
	Applemans	

<i>East Africa</i>	<i>Author</i>	<i>Per- centage</i>
<i>East Africa</i>		
Sudan	Bryant	
	Cruickshank.....	9
Uganda	Gibbins and Loewenthal	54
Kenya	Preston	
	Harley-Mason	
	McMahon.....	51
	Harris	
	Hawking	
Tanganyika	Gibbins	
	Enzer	
Nyasaland	Gopsill	
North Rhodesia	Strong	

#### America

Strong<sup>58,60</sup> has published a compre-hen-sive survey and bibliography of work in Mexico and in Guatemala, to which can be added recent papers by Estrada<sup>23</sup> and by Quevedo.<sup>72</sup>

The incidence in affected parts of Guatemala is around 40 percent (Calder-on 38 percent; Strong 40 to 66 percent; Mira 30 percent).

#### APPENDIX B

All previous reports of M.f. in the eye are of M.f. Onchocerca volvulus with the exception of the two following:

1. Boase<sup>9</sup> reported a case with M.f. in the aqueous and with M.f. A. perstans in the blood. No skin snip was taken, so the identity of the M.f. in the aqueous remains uncertain.

2. McMullen<sup>56</sup> reported a case with M.f. in the aqueous, with M.f. bancrofti in the blood, and with negative skin snip. He concluded that the M.f. in the aque-ous were M.f. bancrofti but, in subse-quent discussion, Manson-Bahr<sup>52</sup> was not convinced.

#### IDENTIFICATION OF MICROFILARIAE IN THE EYE

The following experiments were car-ried out to identify the M.f. seen in the anterior chamber:

1. Thick blood films were taken at

midday and at midnight from 100 Gambians and from 100 Cameroons. The following table summarizes the results:

concluded that the most common M.f. to enter the eye is M.f. *O. volvulus*, and that there is presumptive evidence that

	<i>M.f. A. perstans</i>	<i>M.f. bancrofti</i>	<i>M.f. loa loa</i>	No M.f.
100 Cameroons	42 (s.d. 5.)	Nil.	26 (s.d. 4.5)	32 (s.d. 4.7)
100 Gambians	28 (s.d. 4.5)	31 (s.d. 4.7)	Nil.	41 (s.d. 5.)

Only one loa appeared in a night film, but scanty bancrofti were found not uncommonly in day films. Their periodicity and careful examination differentiated them from loa loa. Some of the patients had a mixed infection of *A. perstans* with either loa or bancrofti.

2. Thirty Gambians with M.f. bancrofti in the blood were examined at midnight. Only one had M.f. in the aqueous and he was found to have M.f. *O. volvulus* in the skin. It is concluded that M.f. bancrofti rarely, if ever, enter the anterior chamber.

3. Thirty patients with heavy infection of *A. perstans* in the blood had no M.f. in the anterior chamber. It is concluded that M.f. *A. perstans* rarely, if ever, enter the anterior chamber.

4. Of 30 patients with M.f. loa loa in the blood, 4 had M.f. in the aqueous, but the 30 cases also had M.f. *O. volvulus* in the skin. Three patients were selected with M.f. in the eye and with heavy infection of loa in the blood. M.f. were withdrawn from the aqueous and in each case found to be M.f. *O. volvulus*. Furthermore, two patients with an adult Loa loa under the conjunctiva showed no M.f. at the time in the eye. It is concluded that M.f. loa loa seldom, if ever, enter the anterior chamber.

5. Including hospital patients, 50 cases were seen with M.f. in the anterior chamber. In every case M.f. *O. volvulus* were demonstrable in the skin. In six cases M.f. were withdrawn from the aqueous and found to be M.f. *O. volvulus*. It is

M.f. in the aqueous are M.f. *O. volvulus* unless proved to the contrary.

6. It is not easy to identify a single M.f. withdrawn from the aqueous—for example: (1) The sheath of M.f. loa loa or bancrofti seldom is visible in a stained preparation; (2) as the nuclei of *O. volvulus* do not reach to the tip, an understained M.f. *O. volvulus* may give the impression of sheathing. The following routine was therefore adopted:

After withdrawal, the aqueous was examined under low power without a cover slip. Any moving M.f. were easily spotted. They were kept under observation and, as the lashings slowed down, it was found that M.f. *O. volvulus* executed a characteristic brisk bowing movement, making its head and tail meet, repeating this to the same side, and tending to straighten out before death. No sheath was present.

M.f. loa loa and bancrofti (transferred from blood to saline) undulated slowly from side to side as their lashing slowed down. At death, and when movements were slow, there was no difficulty in seeing the sheath. (By varying the strength of saline, M.f. loa loa could be made to shrink inside its sheath.)

*A. perstans* is smaller than *O. volvulus*, so that by measurement, by the absence of sheath, and by the characteristic postures before death, a diagnosis of M.f. *O. volvulus* can be made in the unstained preparation. When the preparation is dried, fixed, and stained, the diagnosis is confirmed.

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# NOTES, CASES, INSTRUMENTS

## RECURRENCE OF TOBACCO-ALCOHOL AMBLYOPIA\*

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Recurrence of tobacco-alcohol amblyopia is uncommon but there are some cases on record. deSchweinitz<sup>1</sup> mentioned relapses in several patients with this condition who resumed smoking. Nettleship,<sup>2</sup> Berry,<sup>3</sup> and Shears<sup>4</sup> also described re-

spects. Since the results were good, vitamin-B complex was substituted for the yeast; next, a group was given a poor diet supplemented with vitamin-B complex. Finally, a group was placed on a diet inadequate in all known vitamins, allowed to drink and smoke the usual amount and given just synthetic vitamin B<sub>1</sub>. It seemed reasonable to assume that any improvement in this group could probably be attributed to the vitamin B<sub>1</sub>.

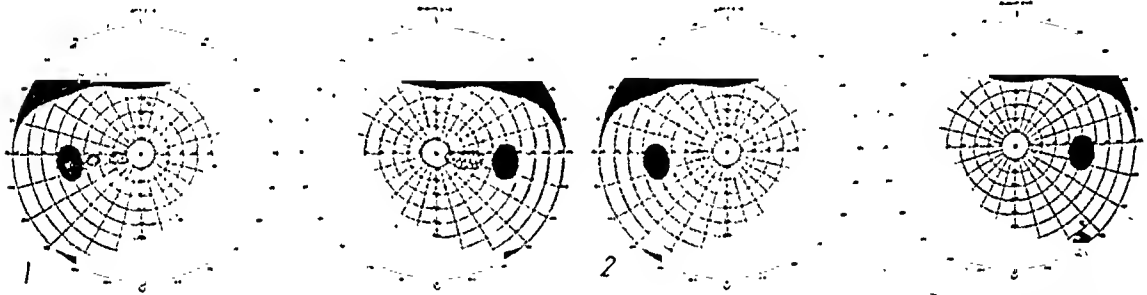


Fig. 1 (Carroll). Visual fields before treatment. Dotted area = 3 mm. red; oblique lines = 1 mm. white; cross-hatched area = 5 mm. red. Vision, R.E. 20/50; L.E. 20/40. Central fields taken at 1 meter.

Fig. 2 (Carroll). Visual fields after treatment. Dotted area = 3 mm. white. Less bright in this area; no definite scotoma. Vision O.U., 20/20—.

currences, and I have seen a few such cases. The purpose of this paper is to report a case which, I think, is of some significance in considering the etiology and treatment of this condition.

During the past eight years certain of these patients have been hospitalized and allowed to continue their usual intake of tobacco and alcohol while under careful observation.<sup>5</sup> When this study was first started the patients were given powdered brewer's yeast in large quantities and a well-balanced diet, adequate in all re-

The patient whose report follows was from this group.

D. W., a colored woman aged 31 years, was admitted to the Institute of Ophthalmology on March 23, 1942. Her vision with or without correction was the same, namely, 20/50 in the right eye, 20/40 in the left. The visual fields (fig. 1) showed centrocaecal scotomas, and the rest of the ocular examination, including the appearance of the optic discs, was entirely negative. Medical examination revealed an enlarged liver, but all other examinations gave normal results. Questioning of the patient and her family indicated that she had been drinking 1 pint of liquor and smoking 1 to 2 packages of cigarettes daily for several years. Our dietitian took a careful dietary history, and from this

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we were able to calculate the following data: the daily caloric intake was slightly over 2,500 calories, which was adequate to maintain the patient's weight and prevent her from appearing malnourished. But about half of the calories came from the consumption of liquor. Knowing what foods she did eat we could estimate the total amount of vitamin B<sub>1</sub> taken each

her vision was 20/30 in each eye and the scotomas were considerably smaller. She was discharged from the Hospital and given 100 10-mg. tablets of thiamin to use at home—1 tablet twice a day.

On leaving the Hospital she returned immediately to the same environment where she had developed this so-called toxic amblyopia. She did the same things,

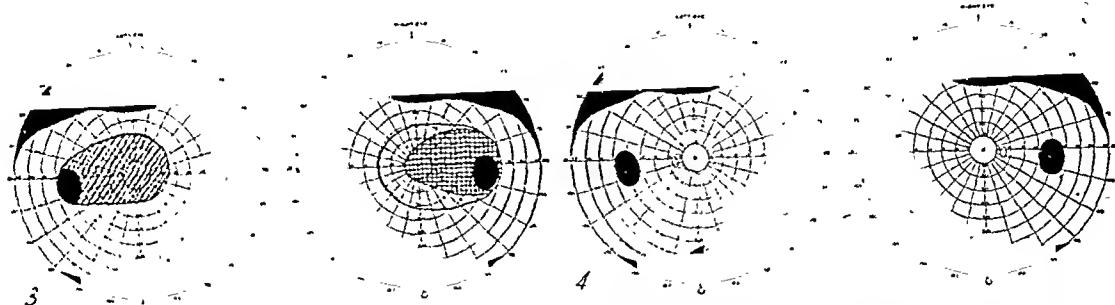


Fig. 3 (Carroll). Visual fields on November 12, 1942. Dotted area = 3 mm. red; oblique lines = 1 mm. white; cross-hatched = 3 mm. white. Vision, R.E. 15/200; L.E. 20/50 -1.

Fig. 4 (Carroll). Visual fields on February 11, 1943. Dotted area = 3 mm. red. Vision O.U., 20/20.

day. And from this we found that she was receiving an inadequate amount of vitamin B for the number of calories consumed (Table 1).

TABLE 1  
RATIO OF CALORIES TO REQUIRED VITAMIN  
INTAKE

Calories from food	1,293
Calories from liquor	1,250
Total calories	2,543
For 2,543 calories	
Minimum daily thiamin requirements	661 micrograms
Actual thiamin intake	501 micrograms
Daily deficiency	160 micrograms

In the Hospital the patient was placed on a diet inadequate in all known vitamins. She received slightly more than 1 pint of liquor daily and smoked her usual amount. But 40 mg. of thiamin by mouth and 20 mg. by vein were administered daily. She continued on this regimen for 23 days, and at the end of that time

consumed the same amount of alcohol and tobacco, ate the same food. Everything was the same except that she took 2 10-mg. tablets of thiamin daily. During the next three months she was seen frequently in the clinic. The vision became 20/20 in each eye and it was not possible to plot any scotomas (fig. 2).

Then the patient disappeared; she did not respond to letters from the Social Service Department, and we could not locate her again until four months later, when she returned to the Eye Clinic because of recurrence of poor vision. She stated that she had continued to take the thiamin until four weeks previously, that two weeks after that the vision seemed slightly impaired and became progressively worse. Vision now was reduced to 15/200 in the right eye, 20/50 in the left; the visual fields (fig. 3) showed large centrocaecal scotomas, especially in the right eye, and there was observed for the first time temporal pallor in the right disc. She complained of itching of the skin and



weakness of the legs. She was moody and irritable.

On admission to the Hospital she was again placed on the same regimen as during the previous hospital stay. X-ray examination of the small intestine disclosed—and I quote from the X-ray report of Dr. Ross Golden—"A definite disturbance in the physiology of the small intestine which we have come to call the deficiency pattern or irritation pattern."

After 10 days the vision of the patient had improved to 20/50 in the right eye, 20/40—in the left, and she was discharged. In a few weeks vision increased to 20/30 in each eye, and the scotomas became very small. At this time she was given vitamin-B complex and was given instructions regarding a well-balanced diet. She was strongly advised to discontinue drinking, but the advice had been given to her by others for several years without effect. Efforts were now made by a psychiatrist and social workers to readjust the individual, and she was followed up to May, 1943. Her vision was then 20/20 in each eye (fig. 4). She continued to drink, as so many of these patients do, despite any advice to the contrary.

Eight months later the patient died from "meningitis" at home. No autopsy was performed. Her family stated that her vision remained good up to the time of death.

There is one point I wish to make in regard to the treatment. For investigational purposes the use of just synthetic vitamin B<sub>1</sub>—that is, thiamin—seems justified. It is of some scientific value, I think, to know that in this and several other cases vision returned almost to normal, apparently due to the use of just this one small fraction of the whole vitamin-B complex. But deficiency diseases tend to be multiple. A pure thiamin deficiency is considered rare by nutrition authorities.

If patients take a diet low in vitamin B<sub>1</sub>, it is usually at least somewhat low in many of the other components. Therefore, in practical therapeutics—in office and clinic practice—the administration of B complex is much to be preferred; it can be supplemented by B<sub>1</sub> if desired. In a well-balanced diet, adequate in all respects, there are doubtless many factors that the research biochemists have not yet discovered. There is still no perfect substitute for a good diet, and all these patients, I think, should receive instructions regarding a good diet. Previously, in patients suffering from tobacco-alcohol amblyopia who failed to decrease or stop their intake of these substances, there was little hope of improvement in vision. Now we have a method of restoring the central vision to many of these patients, even if they refuse to abstain, and I think a fair number of them today have good vision who otherwise would have remained industrially blind. Some of these people who were formerly unemployable now do fine precision work in war industries.

#### SUMMARY

This is a report of a woman with tobacco-alcohol amblyopia who regained normal vision and normal fields, although she did not decrease her alcoholic intake nor improve her diet. Vitamin B appeared to be the factor responsible for the satisfactory result. When the thiamin was discontinued the amblyopia recurred, and when it was used again essentially normal vision was obtained. However, it appears advisable in office and clinic practice to use a good diet supplemented by the whole vitamin-B complex as well as just vitamin B<sub>1</sub> for the best results in the treatment of this condition.

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VISUAL DISTURBANCE AFTER  
INGESTION OF DIGITALIS

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The first use of digitalis in medicine seems to have been made by William Withering and described by him in 1785. In his description he states that when given in large doses it may cause vomiting, giddiness, and a confusion of vision so that objects appear green or yellow, and he cites three cases of visual disturbance of this type. It seems doubtful that the knowledge of this visual disturbance resulting from the use of digitalis is very widespread in the medical profession among those practicing either internal medicine or ophthalmology. In the Journal of the American Medical Association for 1925 (page 716), Sprague, White, and Kellog have an excellent review of the subject up to that time. Their study was prompted by a report of a case by Henry Jackson in December, 1924, at a meeting of the Suffolk Medical Society of Boston. They were unable to find any reference in English indicating any original work on visual disturbances from digitalis at that time, but of such references there were several in the pharmacologic and toxicologic literature. The reason for this is that most of the cases have been due to a frank poisoning by the drug. The American Encyclopedia of Ophthalmology states that visual disturbance from digitalis is a rare occurrence, and in 1885 de Schweinitz quoted but one case. In French and German literature such cases have been reported by

Purkinje, Tardieu, Köppe, Martin, Boucheron, Focke, Lewin and Guillery, Kober, and Uhthoff. The visual disturbance seems to be variable but the most striking characteristic is chromatopsia, objects seeming to have a green or yellow hue. In a few instances red was the color resulting and in other cases objects, especially white objects and flames of fire, appeared blue, and cases have been reported in which objects seemed to be covered by snow or frost.

The first of the patients in the series of four cases reported here complained of this phenomenon and at the time it was not recognized as being due to digitalis, but was believed to be the result of retinal edema and hemorrhages. Scotomas have also been observed, and a relative central scotoma was present in case 4 of this series.

Those desiring to study in detail these conditions, are referred to the article in the American Medical Journal which has been mentioned as the writers there have made a very complete review of the literature up to 1925 and have added seven cases of their own observations.

## CASE REPORTS

*Case 1.* Mr. K. H. R. was first seen in January, 1918, when his age was 32 years, for the correction of an error of refraction. In 1924 he suffered a cardio-renal breakdown as the result of alcoholism. Dr. Alfred Stengel treated him in the University Hospital, where, on September 19, 1942, the ocular fundi were examined by the writer. The discs were hyperemic, with blurring of the margins; there were marked accentuation of the arterial reflex and indentation of the un-

derlying veins, with hemorrhages at both maculas, reducing the vision to: O.D. 5/20; O.S. 5/30. On October 10th, there was an occlusion of the inferior retinal artery, with a corresponding loss of the upper visual field. About this time the patient saw everything apparently covered with snow or frost, an illusion believed due to the retinal condition. He was taking only moderate doses of digitalis. He was discharged early in January, 1925, with vision of 5/5 partly in each eye and went on to a complete recovery of vision both central and peripheral. He died after a coronary thrombosis in 1942. It was not realized until recently that his sensation of the frosting on objects was possibly due to digitalis.

*Case 2.* Mr. F. M. P. was first seen in October, 1924, with incipient lens changes but a corrected vision of 5/5+ in each eye. At that time he had retinal changes with increased arterial reflex and indented veins. In 1937, his cardiac condition became bad and digitalis was given him in rather large doses. After two months of this condition he noticed that all light objects were colored blue, such as white flowers, papers. The digitalis was stopped, and the chromatopsia disappeared within a week. Later administration of smaller doses did not bring a return of the colored vision.

*Case 3.* Mr. M. W. B. was first seen in 1920, when he was aged 46 years, for refraction. In September, 1931, the retinal arteries showed signs of sclerotic changes and these have gradually increased. In 1942, he developed a cardiac condition which was treated with digitalis. After six months of this medication he noticed a blue tinge on all light objects—flames of an open fire, flowers, paper, and so forth. The digitalis was being administered in only moderate amounts and could not be entirely withdrawn, but its omis-

sion for a week caused a complete disappearance of the chromatopsia.

*Case 4.* Mr. H. K. S. was first seen in 1936, when he was aged 64 years, for refraction. There was some irregular hazing of the lenses and a definite increase in the reflex of the retinal arteries as well as irregularity in their caliber. He was the user of an excessive amount of alcohol, and when next seen, in 1942, had very definite vitreous floaters and a marked increase in the sclerotic condition of the retinal arteries. Later his heart began aching badly and digitalis was administered in rather large amounts. In November, 1943, he was again seen on account of blurring of vision and a yellowish discoloration of all light-colored objects. He had a marked change in refraction which accounted for the blurring of vision. On the withdrawal of the digitalis there was a disappearance of the xanthopsia. Small amounts of digitalis, which were prescribed later, did not bring a return of the discolored vision.

No satisfactory explanation for the occurrence of this visual phenomenon has been offered. It seems to us that it is the result of a disturbance of the cells of the visual cortex rather than of any changes in the retinal elements. The only alterations in the fundus appearance that have been noted are those which are part of the cardio-vascular changes for which the digitalis was prescribed.

### CONCERNING THE EARLY OCULAR SYMPTOMS OF MULTIPLE SCLEROSIS\*

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In the early ocular symptoms of multiple sclerosis—a disease of unknown

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causation—there is, in many cases, a retrobulbar neuritis which differs from that produced by other causes. It is characterized by recurrent symptoms from which partial or complete recovery usually occurs early in the disease, and by great variation in the intensity of functional disturbance in relation to the rapid onset of symptoms. Other causes of retrobulbar neuritis such as tobacco, alcohol, lead, arsenic, and other toxic substances or diseases of the brain, do not lead to the same episode of symptoms from which recovery reverts only to repeated attacks before the definite causative factor can be ascribed to multiple sclerosis.

There are some, among whom is Berens of New York, who believe that a chronic posterior sinusitis is a causative factor of retrobulbar neuritis in most instances. There are others, the chief advocate being Benedict of the Mayo Clinic, who believe that posterior sinusitis seldom has anything to do with the production of retrobulbar neuritis. Benedict states that in 10 years' time not a single case of retrobulbar neuritis has appeared at the Mayo Clinic in which a recent attack of acute sinus disease had occurred, nor was severe sinus disease found in a single case of retrobulbar neuritis. Benedict further states that "by a process of elimination of all other probable causes, when the characteristic scotoma can be demonstrated, retrobulbar neuritis often is attributed to multiple sclerosis as an early episode of that disease. Some cases of retrobulbar neuritis have been placed in the category of multiple sclerosis on evidence insufficient to establish that diagnosis, but since the early symptoms of multiple sclerosis are often followed by other unmistakable signs of the disease, and since multiple sclerosis has been proved to be the cause of scotoma in a large number of cases of optic neuritis, particularly the retrobulbar type, the

placing in that category of cases of early symptoms may be justified."

In my experience the earliest ocular symptoms of multiple sclerosis are the transitory disturbances of central visual acuity. Patients will complain of central vision being more or less obscured and in testing it will be found, perhaps, that some of the letters on the normal line cannot be distinctly seen. In a few days these symptoms will have disappeared and the line for full normal vision will be read. There may be no other symptoms. Sometimes only one eye will seem to be affected, occasionally both. No evidence of hysteria may be elicited.

Subsequently, there may be a central or paracentral scotoma, only ascertained by the use of a very small test object. The scotoma may be relative or absolute. It may remain permanent or disappear with the visual symptoms.

In some instances pain is observed on pressure or movement of the eyeball. Indeed, Verhoeff has stated that pain on pressure or movement is characteristic of retrobulbar neuritis, and that he always regards such cases as cases of multiple sclerosis even if the patient never develops any other symptoms of the disease. He believes that multiple sclerosis can be confined chiefly to the optic nerve.

In a certain proportion of cases there is observed a sheathing of portions of the retinal veins with normal arteries. This sheathing may occur "without any visible explanation such as optic neuritis, uveitis, phlebitis, diabetic or hypertensive retinitis, or degenerative changes in the retina" (Rucker).

There are cases, of course, in which there is a sudden onset of blindness, a rapidly enlarging central scotoma, no perception of light after three or four days, with a subsequent complete or partial recovery of vision. This paper is not concerned with such cases. It refers particu-

larly to the patients who complain of mild transitory visual disturbances and in whom, during the first few attacks, not even a small scotoma can be elicited. In some instances the patient will fail to see only a few of the letters on the normal line; in others some of the letters will be described as distorted, a distortion similar to that observed in retinitis. In other instances the symptoms have been attributed to aniseikonia.

For a long time, sometimes for years, sometimes for only months, there may be no other symptoms. The patient may seem to obtain relief from glasses or medication. But later other similar episodes occur, and these recur from time to time until other symptoms more or less suggestive of multiple sclerosis present themselves. A tingling sensation in the extremities and numbness of the hands, arms, feet, or legs; repeated attacks of dizziness or even vomiting or occasional urinary incontinence should arouse suspicion in the physician. Later there may be pallor of the optic nerves in the outer half on one or both sides, and if the ophthalmoscopic examination be made between attacks of the early transitory visual symptoms nothing will be found to account for it.

Of course, after the disease has advanced sufficiently (and this may require years), there will be the classical symptoms of nystagmus, scanning speech, staggering gait, and past pointing. The diagnosis is then definitely established.

These notes are to emphasize the early ocular symptoms and to direct attention to the possibility of multiple sclerosis before any symptoms pathognomonic of the disease have manifested themselves.

The following cases are representative of this discussion and the progress of the disease.

*Case 1.* G. H., a man aged 36 years,

married, was first seen on January 26, 1914. Two weeks earlier he had been struck on the right eye with a very small twig. Two days later he observed diplopia.

Examination showed, O.D. paresis of external rectus muscle and marked pallor of the optic nerve. The margins of the optic nerve of the left eye were blurred. Vision was: O.D. 6/12, Jaeger 1, p.p. 6"; O.S. 6/7.5+, Jaeger 1, p.p. 6".

The visual field, O.D., was slightly contracted for form and more contracted proportionately for colors. The nose and sinuses were normal.

The patient was treated by daily injections into the temples, alternately, of gradually increased doses of strychnine sulfate, together with gradually increased doses internally of iodide of sodium. In five weeks the diplopia had disappeared and vision was: O.D. 6/7.5 (vs. 6/12); O.S. 6/5— (vs. 6/7.5). In another month vision was: O.D. 6/6+; O.S. 6/6+. No neuritis was observed in either eye, but the optic nerve of the right eye was quite pale in the outer half.

The patient was second in command of the *Hermes*, one of the earliest British men of war to be torpedoed in the North Sea, on October 14, 1914. He was in the cold water of the North Sea for some time before being rescued. A few months later vision of the left eye began to fail. He consulted several London oculists, among them Colonel Elliot, who advised that he had an inflammation of the optic nerve. He was under treatment for some time. He was examined by me again in January, 1918—four years after my first examination. Vision was O.D. 6/12; O.S. 6/30. The muscle balance was good. Both optic nerves were quite pale. The visual fields were much more contracted than they had been four years previously. There was a large central scotoma in the field of the left eye.

While in England the patient had been examined by Granger-Stewart, a distinguished neurologist, who found no lesion except in the eyes. At the time of my examination, four years after the first examination, the Romberg test was negative, the gait good, but the patient became easily tired after walking long distances, and the left leg dragged slightly. He had also recently observed a little difficulty in swallowing, the left angle of the mouth appeared slightly weaker than the right, and there was occasional drooling. He found it exceedingly difficult to hold his urine.

The sinuses were negative to direct and X-ray examination. Fifteen months later the difficulty in the left leg (dragging) had so increased that the patient walked with difficulty, the gait was uncertain, the grip of the left hand weak, and past pointing had appeared. There was no impairment of movements of the external ocular muscles and no nystagmus. From this time, five years after the first examination and the appearance of the early ocular symptoms of temporary diplopia, pallor of each optic nerve, slightly contracted fields, central scotoma, and slightly (temporarily) reduced central vision, the symptoms of incoördination, lack of vesical and rectal control, loss of visual acuity continued gradually to increase over a further period of several years until death finally occurred.

*Case 2.* O. J., a boy aged 13 years, first examined on April 16, 1932, had worn glasses for four years which he had obtained from an optician. He complained of impaired vision, worse some days than others. There was a moderate myopia of one-half diopter. With correction, vision was: O.D. 6/7.5; O.S. 6/12.

Both optic nerves were paler than normal in each temporal half. The visual fields for both form and color were con-

tracted, and on the tangent screen both blind spots were outside the fields. At 0.75 and 1.50 meters, when tested on the tangent screen, small tubular fields were present. No corneal anesthesia could be elicited; the knee jerks were slightly exaggerated. There were distinct choreic movements of the head, lids, and shoulder. The nose was normal. Because there was a possibility of an element of hysteria (though the optic nerves were pale), treatment was given with this in view. One week later vision was: O.D. 6/6; O.S. 6/12. In another month vision was: O.D. 6/5; O.S. 6/6. A year later vision was again reduced to: O.D. 6/15—; O.S. 6/6— (the reverse of that observed a year previously). The nerve heads were still pale, and vision was obtained only by pointing to separate letters. The patient now (two years after the first examination) complained of "jerkiness" in his legs, "nervousness" when attending school; there was slight anesthesia of both corneas and other stigmata of hysteria that confused the picture. From now on vision became further reduced, the fields smaller, and a central scotoma appeared in each eye; nystagmus occurred, the gait was impaired, and past pointing was observed. A few years later control of the bladder and rectum was partially lost. Coördination was so impaired that the patient had to help himself around the house by holding on to furniture, only a small amount of vision remaining. And this is the condition of the patient, still alive at the present time, 12 years after the first appearance of the ocular symptoms confused with stigmata of hysteria.

*Case 3.* Mrs. M. C., married, aged 23 years, complained of "blotchy" vision, stating that she saw only part of objects, including test letters on the Snellen chart. The condition had been present about three months. Her second baby was born

one month prior to my examination. She stated that she had observed a similar condition before her first baby was born, but that the symptoms had disappeared after delivery. This time, however, they did not disappear. Vision was: O.D. 6/6, Jaeger 1, p.p. 8"; O.S. 6/7.5, Jaeger 1, p.p. 8".

The patient was obliged to pick out a single letter at a time and could not read rapidly. The pupillary reactions, blind spots, urine, blood pressure, blood chemistry, blood Wassermann test, were all normal. The visual fields were slightly contracted, and the right lateral half of each visual field was slightly hazy, almost a right lateral hemianopia. Apparently there was a low-grade neuroretinitis involving the upper margin of each disc. Knee jerks were normal, there was no Romberg sign, and the nose was normal.

In a week vision in each eye had increased to 6/5. The Snellen letters were now read quickly without hesitation. The right-sided haziness in the visual fields had entirely disappeared.

In another two weeks there appeared an absolute central scotoma in the field of the left eye, and central vision was reduced to 6/15 in each eye. In another month vision was 6/6 in each eye and the central scotoma was relative instead of absolute. A month later vision in each eye was 6/6—. There was no scotoma. A little fuzziness was observed at the upper margin of each optic nerve. However, there was much aching of the eyes, especially on pressure. This is believed to be possibly a case of multiple sclerosis with the very earliest ocular symptoms. No other symptoms other than those of the eyes have yet been observed.

#### CONCLUSIONS

"Blotchy" vision, interrupted vision, slow vision, changing from time to time, with blurring of the optic nerve or nerves,

with or without contraction of the visual fields, central or paracentral scotoma, deep-seated pain on pressure, are suggestive of the earliest stage of multiple sclerosis; hence this disease must be borne in mind whenever these symptoms are observed. The appearance of some of the classical pathognomonic symptoms at some later date will confirm the diagnosis.

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#### ON BIASTIGMATISM.

JOSEPH I. PASCAL, M.D.  
*New York*

The paper on this subject by Linksz and Triller published in the September, 1944, issue of the American Journal of Ophthalmology, must be of interest to all ophthalmologists, and especially to those who have followed up Marquez's writings on the subject. The claim by Marquez, that his bicylindric method (this name seems appropriate) gives considerably better results than the usual monocylindric methods, has not been borne out by the actual practical tests made by Linksz and Triller. From a theoretical standpoint, and considering only the mechanics involved, one would not expect it otherwise since two obliquely crossed cylinders can always be reduced to a spherocylinder of approximately the same strength. It would seem then at first thought that Marquez's technique was based on a fallacy.

However, the story is not quite so simple as that. The rationale of the bicylindric technique is sound, to my mind at least, if one accepts the premises laid down by Marquez. He firmly believes in the existence of astigmatic accommodation; that is, that the eye can accommodate so as to produce unequal effects in the different meridians. Most observers

deny the existence of astigmatic accommodation on theoretical and practical grounds. But there are a few who believe in its existence, and Marquez is one of them. The question is still an open one—just like the question of the existence of negative accommodation.

Now, astigmatic accommodation, assuming that it exists, must involve a greater effort than does regular spherical accommodation. The drive to make this extra effort presumably comes from a desire to overcome an existing corneal astigmatism. In other words, just as there is a nonvolitional impulse to overcome hypermetropia by means of spherical accommodation, there is a nonvolitional impulse to overcome corneal astigmatism by means of astigmatic accommodation. This would tend to create a dynamic lenticular astigmatism wholly or partly sufficient to neutralize the static corneal astigmatism. The residual astigmatism then, which consists of all the astigmatism in the eye except the corneal component, may consist of some static lenticular astigmatism and, what is more important, of some dynamic lenticular astigmatism.

It would seem that just as in the effort to overcome hypermetropia the accommodation may get into a spasm, so in an effort to overcome static astigmatism, the accommodative effort may produce spasmodic, irregular activity. If, now, the main reason for the drive for astigmatic accommodation were removed—namely, by fully correcting the corneal astigmatism—then the spasmodic astigmatic accommodation would cease and the true

refractive error would be found. The residual astigmatism would then consist of the static lenticular plus whatever other astigmatic surfaces there are. The only way to achieve the relaxation of the astigmatic accommodation is by the bicylindric method.

There are, to be sure, some weak points in this rationale. For example, the urge for astigmatic accommodation may come, in part at least, from the presence of static lenticular astigmatism aside from that of the cornea. Furthermore, it is doubtful, even granting all the premises, whether one can produce relaxation of astigmatic accommodation immediately simply by correcting the corneal astigmatism. It would generally take some time for old habits to break down, and for this purpose it were better to have the patient wear the corneal correction for a while and note the effect on the total astigmatism. These weak points, however, do not invalidate the soundness of the rationale behind the bicylindric technique, on the premises promulgated by Marquez.

This defense of the bicylindric technique is not meant to disparage the Lancaster-Regan monocylic technique. Properly used<sup>1</sup> it is an excellent method and much less complicated than the other. In this technique the ophthalmometer readings are used as a guide for and are modified in the light of the other tests. The Marquez technique, however, is not without merit and is still open for further investigation.

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# SOCIETY PROCEEDINGS

EDITED BY DONALD J. LYLE

## NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

February 7, 1944

DR. SIGMUND AGATSTON, *presiding*

### AVULSION OF THE OPTIC NERVE

DR. EDWARD SASKIN described the case of a colored woman aged 24 years, who reported for treatment for a compensable injury to the left eye. This injury was of no significance, but examination revealed an old lesion, of which she had no knowledge, in the right eye. This eye had a disuse exotropia with vision reduced to perception of hand movements at 6 inches. The media were clear. The fundus examination revealed a typical picture of optic-nerve avulsion—optic atrophy, marked diffuse retinal atrophy, obliteration (silver wire) of all retinal veins and arteries except for new-formed vessels below the pale disc, and a dead-white mass in the macular area, about  $1\frac{1}{2}$  to 2 disc diameters in size, projecting into the vitreous and towards the disc. There was a similar but smaller mass on the disc. These probably represented old hemorrhages.

The genesis of the picture was thought to be a birth injury.

### KERATOCONJUNCTIVITIS SICCA

DR. JOSEPH J. FRIED stated that a woman, aged 55 years, had been suffering from keratoconjunctivitis sicca since 1938. The condition was bilateral and the corneas were markedly affected. All ophthalmic therapeutic suggestions were tried including sealing of the puncta. Despite failure of recanalization of the obliterated canaliculi and application of local ophthalmic measures, there was no improve-

ment until June, 1941, when a combined endocrine treatment with stilbestrol, premarin and progesterone were alternately administered. Local ophthalmic therapy was stopped. With two months of endocrine treatment striking improvement was noted in the eye condition and in the associated dryness of the naso-pharynx, skin, pruritis, and vaginal itch. The patient was kept on an appropriate endocrine level and has appeared practically healed for the past three years.

A more decided endocrine approach to keratoconjunctivitis sicca was emphasized instead of purely local treatment and half-hearted attempts with some estrogenic extracts. Topical application of progynon in oil to the conjunctival sac was suggested, based on favorable results obtained in atrophic rhinitis caused by hypogonadism or menopause.

*Discussion.* Dr. James W. Smith stated that he found Dr. Angus MacLean's water-bath spectacles, with wicks to the outer canthi, effective in keeping the eyes moist.

Dr. Ralph Lloyd said that he saw a woman, in the menopause, with bilateral keratitis sicca with small erosions in one eye. Estrogenic therapy relieved the symptoms and cleared up the erosions. Another case presented a typical keratitis filamentosa following the removal of a dermoid cyst deep in the orbit, which suggested ciliary-ganglion damage as one of the causes of this condition.

Dr. Bertram Kramer, in the belief that microscopic sections show corneal edema, said that he used hypertonic salt solutions to draw off the water. This resulted in improvement but obviously could not be used indefinitely.

Dr. Max A. Goldzieher considered

keratoconjunctivitis sicca a manifestation of a metabolic disturbance of epithelial cells affecting the skin and mucous membranes elsewhere. This disturbance responds to estrogenic therapy. The appearance of the condition in younger women and men does not invalidate the theory of the etiology, since cutaneous application of estrogens has been effective in males. Estrogens are produced in the male body and apparently play a role in cellular metabolism.

#### REMOVAL OF INTRALENTICULAR FOREIGN BODY RESULTING IN LOCALIZED OPACITY

DR. BERNARD KRONENBERG presented the case of a man, aged 39 years, who had an intralenticular foreign body in the right eye. On March 18, 1942, while hitting a chisel with a hammer, a piece of steel pierced his right eye. The following day the vision was 20/70, corrected to 20/40+2 with  $-0.75D.$  sph. External examination showed a vertical linear scar on the cornea, extending through the entire corneal thickness. The anterior chamber was intact and on the anterior capsule of the lens there appeared to be a small linear opacity which, under the slitlamp, was seen to extend into the nucleus. Ophthalmoscopy revealed an opacity in the lens. The patient was hospitalized and X-ray pictures were taken which localized a radio-opaque foreign body in the lens. The next day the foreign particle was removed by means of a giant magnet. It was first brought into the anterior chamber by applying the magnet to the path of entry. An attempt was made to bring the foreign body out of the anterior chamber through the corneal wound. This was unsuccessful and the anterior chamber had to be opened at the limbus with a keratome and the foreign body brought out through the new opening with a hand magnet.

Treatment with atropine, vitamin-B

complex, and vitamin C was instituted and continued for a month. At this time the eye was white and with  $-0.50D.$  sph.  $\Rightarrow -0.50D.$  cyl. ax.  $75^\circ$  the vision was 20/30. One year later the vision was 20/30 with  $-1.25D.$  cyl. ax.  $75^\circ$ .

The purpose of presenting this case of intralenticular foreign body was to demonstrate the value of early removal of a foreign body. Even though the anterior capsule was ruptured and the foreign body lodged in the lens, early removal resulted in the formation of a localized lenticular opacity only. It did not, as was expected, result in complete opacification of the lens. The visual result was extremely satisfactory. It was commonly thought that when a diagnosis of lenticular foreign body was made, it was best to defer surgery until the traumatic cataract had matured, when the foreign body could be removed along with the cataract. This case showed that it is advisable to remove the foreign body at the earliest possible moment, so that the rest of the lens will not become opaque, thus insuring retention of binocular vision. The anterior capsule may unite and heal very quickly, not allowing the aqueous to enter the lens and cause swelling and dissociation of the lens fibers. Another reason for early removal is the possibility of siderosis.

*Discussion.* Dr. Ernst Waldstein said he had removed a foreign body from the posterior lens cortex with the magnet, the lens remaining clear for many months before the patient disappeared.

Dr. Daniel M. Rolett recalled having injured the lens capsule with the tip of the keratome during an operation. A pin-head-sized area of haziness, which was seen four weeks later, did not enlarge subsequently. He believed that small rents in the lens capsule are capable of healing and sealing off the aqueous from the lens.

Dr. Sigmund Agatston believed that opacification following injury of the lens

may be localized when the injury is peripheral.

#### TREATMENT OF CAVERNOUS-SINUS THROMBOSIS WITH PENICILLIN AND DICOU-MARIN

DR. BERTRAM S. KRAMER presented the case of a married woman, aged 40 years, who was admitted to the hospital with a diagnosis of orbital cellulitis of the right eye, five days after two molars were extracted on the left side. The right eye showed a complete external and internal ophthalmoplegia. The left eye showed no dilated veins but there was edema about the entire eye. Later the right eye developed a thrombosis of the central retinal vein and, because of an extension of the edema, a diagnosis of cavernous-sinus thrombosis was made. Sulfadiazine was administered in large doses, but the patient showed no response. Penicillin was then given along with sulfadiazine. Because of neurologic signs which suggested that the thrombus was extending backward, she was given dicoumarin by mouth. Shortly thereafter both tooth sockets began to ooze. The patient lost the sight of the right eye but recovered from the cavernous-sinus thrombosis and left the hospital five weeks later. She also had severe diabetes and hypertension. It was Dr. Kramer's belief that the dicoumarin helped her condition materially.

*Discussion.* Dr. Daniel Kravitz said he had treated a case of cavernous sinus thrombosis following cellulitis of the face. *Staphylococcus aureus* was cultured from the blood. Recovery occurred in less than two weeks on heparin and penicillin, the latter administered intravenously and into the orbit through drainage tubes.

Dr. Kramer said that dicoumarin is believed to be safer than heparin. It has no action on the liver or erythrocytes; its only danger being the tendency to hemorrhage when the dosage is not controlled. In this case the negative blood culture was

explained by the immediate administration of sulfathiazole. Unilateral or bilateral occurrence in cavernous-sinus thrombosis depends on whether the thrombus extends directly backward or through the intercommunicating veins to the other side.

Dr. Alfred Kestenbaum questioned the diagnosis because of the rarity of unilateral cavernous-sinus thrombosis, absence of chemosis at the onset, and lack of engorgement of the retinal veins; in addition, because facial and trigeminal paresis are not among the signs of cavernous-sinus thrombosis.

#### ANIRIDIA. TREATMENT OF COMPLICATED GLAUCOMA WITH DORYL

DR. DANIEL KRAVITZ said that he considered the greatest advance in the medical treatment of glaucoma in the past few years the synthesis of a large group of cholinergic drugs: mecholyl, prostigmine, furnethyl, and doryl or carbaninoylcholine. Doryl is a powerful parasympathetic-system stimulator, and is many times as active as acetylcholine and in addition is very stable. It is likewise a powerful peripheral vascular dilator. In the following unusual case he had had a gratifying result with doryl.

D. S., a man aged 28 years, complained of sudden loss of vision in the right eye which occurred two weeks previously. He had had very poor vision since birth and six years ago had suddenly lost the vision of the left eye.

The vision of the right eye was reduced to the perception of shadows. There was a complete aniridia. The lens was swollen and diffusely milky white. The tension was 20 mm. Hg (Schiötz). There was absolute glaucoma of the left eye and complete aniridia. A staphyloma above involved the ciliary body. The lens was cataractous and degenerating.

A linear lens extraction was performed three weeks later. The postoperative

course was uneventful. The vision was 20/200 with correction. Eleven days following discharge from the hospital the patient experienced severe pain in that eye. Examination showed that the tension was 4+ and the vision was reduced to light perception. The tension was not relieved by pilocarpine, eserine, or prostigmine alone or in combination. Doryl kept the tension down to 20 mm. for almost two years and the patient was able to carry on his usual work.

*Discussion.* Dr. James W. Smith stated that he had four cases of partial aniridia in one family. Two patients had glaucoma, one requiring surgery. In all cases of aniridia there is a rudimentary iris, often adherent to the cornea, which probably accounts for the 25-percent incidence of glaucoma. Aniridia shows the greatest hereditary tendency of any ocular condition.

Dr. Kravitz, in closing, stated that gonioscopy showed the presence of an iris root apparently turned in on itself, and an open chamber angle. The mechanism of the action of doryl is not clear.

#### INTRACRANIAL ANEURYSM WITH OCULAR SIGNS

DR. JAMES W. SMITH presented a woman aged 34 years, who had negative ocular, medical, and family history. She suddenly developed low frontal headaches on the left side. Within two weeks ptosis and partial oculomotor paralysis occurred. The head pain persisted, increased in severity, extended to the back of the left eye, and was followed by complete external and internal ophthalmoplegia. Diagnosis of aneurysm of the left internal carotid artery was made. Three weeks after the onset of headaches the patient fainted and was hospitalized for a subarachnoid hemorrhage.

Through neurosurgical operation, three weeks later, an aneurysm was exposed at the base of the skull, compressing the

third cranial nerve. Six weeks after operation the ptosis cleared and the excursion of the internal rectus muscle had returned to half of normal. The other muscles supplied by the oculomotor nerve responded slowly and incompletely. When the patient was seen six months post-operatively, only the internal rectus movement was normal.

Abnormal lid movement was present due to misdirection of fibers of the third nerve in regeneration. Adduction produced a 4-mm. elevation and abduction produced a 2-mm. drooping of the upper lid.

An atypical pupillary reaction was noted. The pupil was dilated to 5.5 mm. and did not react to direct and consensual light stimulation. Adduction produced a contraction of 1 mm. and convergence caused an additional 0.5 mm. of contraction, suggesting a type of unilateral Argyll Robertson pupil. Pupillographic investigations have not been completed.

The eyegrounds and visual fields were normal throughout the clinical course. The right eye was normal.

*Discussion.* Dr. Ferdinand Koch pointed out that there exists a basic difference between the situation presented by Dr. Smith and that of the supraclinoid intracranial aneurysm. The latter, after a more or less prolonged period of diagnostic and prognostic confusion, ends fatally. Dr. Smith's case is an instance of a mycotic intracranial aneurysm in a typically infraclinoid location in a patient not yet in middle life.

#### DIVERGENCE EXCESS AND OTHER ABERRATIONS OF MUSCLE TONE

CAPT. ADOLPH POSNER (MC) presented a new concept regarding the interpretation of divergence excess which has been published in this Journal (1944, v. 27, Oct., p. 1136).

*Discussion.* Dr. Joseph Pascal agreed that many phorias are artifacts due to

dissociation of the normal binocular functioning of the eyes. The case showing an apparent esophoria and exophoria is explained by eye dominance, accommodative activity of the fixating eye, and old habit. For example, diplopia may occasionally be elicited with a red glass before the nondominant eye which, giving up fixation, permits the phoria to become manifest; the dominant eye, which maintains fixation when the red glass is before it, shows an orthophoria.

Dr. Bertram Kramer pointed out that phylogenetically and embryologically the eyes are on the side of the head and their forward growth is not complete, hence a positive angle gamma and divergence for distance is normal; convergence must be acquired. Alternating hyperphoria has been explained by the greater strength of the inferior obliques as compared to the superior obliques.

Dr. Arthur Linkz explained the apparent eso-exophoria on the basis of a possible paresis of the left internal rectus muscle. Fixation with the right eye would then permit divergence of the left eye. Fixation with the left eye, because of the greater innervational impulse required, would call first for marked dextroversion, and then for overconvergence of the right eye.

Dr. Morris Davidson had observed a similar phenomenon, an esophoria of one eye when the other eye, with a macular lesion, attempted to fixate.

Dr. Alfred Kestenbaum explained the eso-exophoria on the basis of the greater convergence impulse when fixating with the hyperopic left eye as compared to fixation with the emmetropic right eye.\*

Leon H. Ehrlich,  
Secretary.

\* EDITOR'S NOTE: And see discussion of this subject by Walter B. Lancaster, M.D., in this Journal (1945, v. 28, Jan., p. 96).

## ROYAL SOCIETY OF MEDICINE

### SECTION OF OPHTHALMOLOGY

February 11, 1944

MR. F. A. JULER, *president*

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#### EMBOLISM OF THE RIGHT INFERIOR RETINAL ARTERIAL DIVISION

MR. HUMPHREY NEAME presented S. G., a housewife, aged 23 years, who was seen for the first time at Moorfield's Eye Hospital, with a history of migraine. The corrected vision was 6/9 in each eye. Twenty-one months later the patient complained of partial loss of sight in the right eye for five days. It was ushered in with a migraine phenomenon with colored lights. She gave a history of occasional complete "blackout of one eye" lasting for a second, and then the appearance of spots lasting for about 10 minutes, followed by severe headache. The history was suggestive of migraine.

Examination of the fundus of the right eye showed a cloudy area of retina occupying the inferior temporal quadrant and part of the inferior nasal quadrant. Retinal vessels near the disc were somewhat obscured. With the pupil of the right eye dilated, the vision, with correction, was 6/60, with eccentric fixation. The vision of the left eye, with correction, was 6/6. A pale-yellowish-colored block was seen in the inferior temporal artery at its division from the inferior nasal artery.

Physical examination revealed nothing abnormal in the circulatory system. Blood pressure was 130/80. The bleeding time was 3¾ minutes. Coagulation time was 1 minute 50 seconds. Wassermann reaction was negative.

Three months later the yellowish block was much less clear, but a bright reflection was seen on the somewhat enlarged artery at that site. The artery wall was visible as a pale grayish border on the optic disc. The color of the fundus below was now normal. Visual fields, as charted on the Bjerrum screen, showed loss of the upper half of the field to 2/2,000 white. The vision of the right eye, with correction, was 6/18, not with direct fixation.

**BILATERAL PTOSIS AND ATYPICAL SLANT EYES ASSOCIATED WITH UNILATERAL SYNDACTYLY, ADACTYLY, AND BRACHYPHALANGY**

MR. D. V. GIRI presented D. B. D., a boy aged 18 years, who complained of headaches. There was nothing unusual in the eyeballs. The palpebral apertures were narrow, the right greater than the left, and obliquely set with the internal canthi lying higher than the external.

On the left hand the thumb and index finger were syndactylous throughout; because of this the thumb was bent at the phalangeal joint and the index finger, which seemed to have only two phalangeal bones, the distal one of which was poorly developed, was curved toward the thumb and prevented from attaining greater length than the thumb. There were two nails which were fused into a ridge where they met and were somewhat concave laterally on either side of the ridge. The middle and ring fingers were absent, and the little finger, which had only two phalanges, appeared stouter than normal. There was plenty of power, flexibility, and manipulative skill in the hand. There were no other abnormalities in the body.

The father had atypical slant eyes similar to those of the patient, but no ptosis and the mother had bilateral ptosis, but the eyes showed no slant. The patient had two brothers who had no abnormali-

ty, except that the one was unusually tall, measuring 6 feet 6 inches. There was no evidence of heredity in the parental pedigrees.

It is possible that some or all of the abnormalities, either modified or unmodified, will be inherited by some of the patient's progeny, and by all, if the mate also contributes similar abnormal genes.

*Discussion.* Mr. O. G. Morgan said that from a eugenic point of view this condition was not a very serious one as it only produced a very slight disfigurement and a defective hand on one side. There was no mental deficiency. Thus, there was probably no need to advise against marriage in this case.

**CORNEAL FOREIGN BODY (GLASS SPLINTER) PROJECTING INTO ANTERIOR CHAMBER**

MR. VICTOR PURVIS presented L. S., a boy aged 14 years, who had broken his glasses and a small piece of glass became embedded in the deeper layers of the cornea and projected for the greater part of its length into the anterior chamber. The lens and vitreous were clear. The fundus was normal. The vision, with correction, was 6/9. It was decided at the time to make no attempt to remove the glass, and the eye had remained unchanged since the injury, five years ago.

**TWO CASES OF CENTRAL VENOUS THROMBOSIS**

MR. VICTOR PURVIS presented these cases to demonstrate the difficulty of making a diagnosis of this condition when it is of long standing. In the one case there was massive exudation, the hemorrhages having become for the most part absorbed; in the other case the hemorrhages and exudates had been completely absorbed, leaving two areas of retinal cystic formation, at the macula and over the nasal half of the disc. This

cystic degeneration of the retina in the second case is not common, but is of great interest, for it has all the appearances of a localized detachment.

#### THE MICRO-DIAGNOSIS OF CONJUNCTIVITIS ARTEFACTA

MR. JOHN FOSTER presented a paper on this subject. He stated that conjunctivitis artefacta is a term of uncertain meaning; that he would define it as conjunctivitis knowingly self-induced to obtain sympathy, compensation, or evasion of military service. Historically, the first type is as old as hysteria and mendicancy, the second as the Workmen's Compensation Act, and the third was the subject of a mass prosecution in the French Army in 1807.

Diagnosis by microscopic identification of the causative agent was foreshadowed by Conan Doyle's "Monograph on 114 varieties of cigar ash" mentioned in the "Sign of The Four" but was first applied systemically to conjunctivitis by the French in the last war. The method has the advantage of rapidity, and, with a little organization, of simplicity. He said that in practice the chief difficulties of application are due to (1) difficulties in collecting and preserving specimens; (2) lack of proper though simple apparatus and reagents at the material time; (3) vague or absent description of the microscopy of some irritants. To appreciate the use and limitations of the method conjunctivitis artefacta must be shortly considered.

*Method of production.* The irritants recorded in the literature are most varied, ranging from leech bites to insertion of dental tartar and transfer of trachoma.

Traditional knowledge (an individual may produce a local epidemic) based on a desire to avoid permanent injury to sight, and accessibility of material such as condiments, limits the cause as a rule in Al-

lied Territory to the list given below, in which signs peculiar to specific irritants are mentioned. This enables a study of the microscopy of most possible agents to be made in advance.

*The general characteristics*, though not invariable, are as follows: (1) Improbable etiology and unexpected relapse. (2) Exacerbation by ordinary treatment. (3) Secretion catarrhal rather than purulent. (4) Purulent discharge, if present, most marked in the morning. (5) Striking chemosis with subconjunctival hemorrhage and little discharge. (6) Unilateral. (7) Predominantly affecting lower lid and lower half of cornea, owing to gravity and the tight fit of the upper lid. (8) Undue prolongation of conjunctivitis following minor corneal injury.

The classification of usual causes (with special characteristics) follows:

Direct trauma. Rubbing with saliva-covered finger, match head, pencil (copying ink). Tendency to subconjunctival hemorrhage.

Local vegetable irritants. Mustard, tobacco, snuff, and pepper. Particles tend to "string" themselves on threads of mucus. The Chinese use tobacco as an eye treatment.

Oriental vegetable irritants. Pulp of jequirity, croton and castor-oil seeds. Acute chemosis with small central area of necrosis leading to a local symblepharon.

Unorganized deposits. Soot (as solid or straw smoke) slack, coal, dust, earth, and cigarette ash. May be found in one lower fornix only. Being only slightly irritant, they are often inserted just before examination. Must be differentiated from airborne dust, which adheres in great amounts to any blob of pus at inner canthus, but gets into the lower fornix only in high wind or filthy atmosphere. The injection produced is brighter red than that due to the local vegetable irritants.

Calcium salts.  $\text{Ca}(\text{OH})_2$ ,  $\text{CaSO}_4$ . Heavy corneal scarring with a petrifying incrustation of the lashes has been observed from mortar and a conjunctivitis has been produced by toothpaste, the features of which, except that it is both severe and chronic, are not familiar.

Soap is undetectable microscopically, and even in quantity is difficult to identify for forensic purposes unless it contains carbolic acid (Roche Lynch). As normal pH of the tears is 7.8 and household soap is alkaline, British Drug Houses phenol red paper (pH 6.8 to 8.4), which is yellow or faintly pink, in normal tears, might be used to detect recent insertion. Catarrhal inflammation, particularly rosacea, seems to increase the pH a little. Tintometric methods are useless, as the proteins and variable  $\text{CO}_2$  content of tears prevent an accurate estimate, and good toilet soap is neutral. A slip of old dry soap may even be acid.

Fluids. Urine, petrol, zinc chloride (killed spirit), OdoRoNo, whose composition is not listed in Martindale but probably like most deodorants contains betanaphthol.

Signs of the foregoing type, although they indicate probabilities rather than certainties, may be so clear that the surgeon and military or legal authority are convinced.

In other cases where the signs are not clear-cut, to avoid injustice a confirmation by concealed observation or confession may be necessary. As malingerers do not, as a rule, wish to blind even one eye permanently, an explanation of the serious condition of the eye, plus a query regarding a self-applied treatment may elicit a confession. Sometimes direct questioning is enough.

If not, the following methods of examination may clarify matters:

(1) To exclude natural causes: (a) syringing of the lacrimal sac; (b) con-

sideration of overtreatment (a patch test); (c) exposure of upper fornix (Terson's method).

(2) Examination of conjunctival smear: Bollack found a marked eosinophilia in the discharge in 10 cases of chronic conjunctivitis artefacta. Unfortunately, although this is only found naturally in pemphigus, spring catarrh, and the rare "necrotic staphylococcal" conjunctivitis, it may not help much, as it may be peculiar to the rare variety due to ipecacuanha. One of Bollack's cases was of this nature, another caused by an unspecified insecticide, and the other eight were uncertain though probably due to ipecacuanha also. He had never used this test himself.

(3) The culture of the conjunctival sac is alleged to be negative in ipecacuanha cases, and frequently so in others. He said that he found that streptococci or mixed secondary infection may occur in artefacts due to dust and tobacco.

(4) Occlusive collodion bandage. He said he had heard senior colleagues describe this measure as impractical, and it is useful only as an in-patient measure, where it can be watched. A small pad only should be put over the eye, with several layers of collodion-soaked gauze to follow. Special care should be paid to the upper nasal edge, where it is liable to separate, and the surfaces for adhesion are narrow. Blegvad has suggested a mask like the old "P.H." helmet (used in the last war as an antidote to phosgene), with watchglass eyepieces, and an opening for the mouth only. Where continuous observation is not possible, Wright has suggested a tarsorrhaphy complete except for 2 mm. at either end. It is possible that thermoplastic methylacrylate may solve the mechanical side of this problem.

Clinically, if the eye is irrigated before application, the bandage may cure the eye



in three days. If secondary infection is well established, this may be exacerbated, and cloud the issue.

(5) Search of belongings on admission including purse, back of watch, steel helmet lining.

(6) Microscopic examination for irritants: This is an adjunct only to other clinical methods, and effective only in cases due to causes in the following groups: local vegetable irritants, unorganized deposits, and calcium salts. It is rapid, applicable at the first examination, and a positive finding is conclusive.

Persistence of detectable deposit. He said he had no accurate information on this point, but had found excessive coal-dust deposit three days after, and fine wood dust two days after exposure in "naturally" inflamed eyes. In an artificial case the deposit is heavier, and as Caiger has indicated, may be renewed by the patient, as the effects may be transient. If nothing is found at the first examination, and the eye is recovering: (1) Give warning via a subordinate of a "special" examination, next day. (2) Do not irrigate the eye prior to examination. (3) After remarking that the eye is looking better, leave the patient alone in the middle of the examination, after insertion of a drop of saline to "dilate the pupil."

The technique of collecting and examining specimens was described. Microscopic descriptions with photographs of deposits were presented.

*Discussion.* Lt. Col. R. E. Wright said his experience was concerned with irritant remedies as a cause of blindness in the East rather than the self-inflicted conjunctivitis due to irritants defined by the title of Mr. Foster's paper.

Two varieties of self-inflicted injuries are: Those produced deliberately with intent to evade duty such as occur in malingerers in the military or civil life, and those produced because of some underly-

ing psychogenic affection. These have much in common, but neither offers definite clinical criteria. The malingerer's lesion is frequently one of the lower fornix on one side. One may identify the irritant *in situ*, or base diagnosis on a localized lesion, its appearance, the type of individual exhibiting it, and intuition; a suspicious history may help. In the Madras hospital "policeman's eye" was diagnosed offhand in government employees for the most part correctly. Seldom had one to use detective methods. The diagnosis was affirmed and suitable treatment adopted, for example, penciling the upper palpebral conjunctiva with 2-percent silver nitrate. This frequently answered, the patient considering the treatment too great a price to pay. The malingering soldier may require an occlusive bandage. If the cornea is not involved—it seldom is in malingerers—and infection excluded, one may occlude the eye for some days, placing a suitable ointment in the fornix. The eye-pad may be fixed to the circumorbital skin with collodium flexile. A plaster of Paris bandage over a well-padded and bandaged eye can be split behind, removed, and re-fastened any time after setting. The response of the conjunctiva to an irritant varies with the individual. All the appearances of a conjunctivitis artefacta may be produced by a coagulum of 10-percent protargol. Slaked lime as used by betel chewers in India, portions of chewed tobacco, or anti-gas ointment may only produce a red velvety fornix. Identification of irritants is best left to a chemist with forensic experience. Quicklime produces a violent reaction with conjunctival (and maybe corneal) necrosis. He said he had seen total hypopyon after a quicklime fornix injury without direct corneal damage. A localized eschar or croupous membrane, on the apposed surfaces of the lower fornix, may be sug-

gestive of conjunctivitis artefacta. In such cases one should exclude a Klebs-Löffler or other virulent infection. A bacteriologist should always be consulted; he may identify an unexpected organism indicating the method of infection.

Excretions may enter the eye deliberately or accidentally. Certain lower-fornix eschars and croupous lesions cannot be identified as self-inflicted, even when exhaustive bacteriologic investigation proves negative, and microscopy reveals merely eosinophilia with uncharacteristic granulation tissue. These obscure pseudomembranous lesions tend to have sequelae like conjunctival burns. Their surface healing is accompanied by subconjunctival solid edema, deep fibrous-tissue formation, late shrinkage, pocket formation, symblepharon, and sometimes the eventual picture of so-called essential shrinkage. This leads toward a more complex field, the chronic granulomata, outside the subject under discussion.

In psychoneurotics the upper conjunctiva is sometimes the seat of election and the foreign substance perhaps oftener less irritant in type.

Major E. F. King said that there was a condition of the cornea which he had found to be helpful in these cases; namely, in the lower third of the cornea a curious punctate drying of the epithelium. This was quite sharply confined to the area stated and was obviously an effect of irritation from the outside.

With regard to occlusion of one-eye with a shield or by some other method, this always seemed to raise its own problems. The ventilation of the eye was interfered with, which in itself led to a certain amount of irritation.

Mr. Humphrey Neame said that there had been no great emphasis on the right- or lefthandedness of these persons. In suspicious cases it was worth while testing whether the person was righthanded

and righteyed. He recalled one case in which the left eye was maltreated, and the person was lefthanded. He was quite convinced from the appearance that this was an artefact.

Mr. Frederick Ridley said that he had a case similar to that described by Major King, which also showed fine superficial staining of the lower half of the cornea. He was almost sure the patient was a malingerer. This staining might prove to be of real diagnostic importance. He wondered whether Mr. Foster had thought of the use of sodium alginate to pick up and fix fine dust or other material introduced into the conjunctival sac. The sodium salt was precipitated as calcium alginate and the tough jelly so formed was a suitable embedding material for subsequent staining and the microscopic examination. A kallodont mask was easily made and was an effective shield if tied above and below the ears and the knot sealed.

Mr. Foster, in closing, said that he regretted he did not know anything about sodium alginate nor had the relationship between right- and lefthandedness come within his purview. By analogy with skin diseases there might easily be some relationship between handedness and the inflamed eye.

## COLLEGE OF PHYSICIANS OF PHILADELPHIA

### SECTION ON OPHTHALMOLOGY

February 17, 1944

DR. WARREN S. REESE, *chairman*

### MARCUS GUNN PHENOMENON

DR. EDMUND B. SPAETH and DR. JAMES S. SHIPMAN presented two cases of the Marcus Gunn phenomenon. The first patient had completely immobile eyeballs due to surgically demonstrated

fibrosis of all the extraocular muscles. The levators, however, were surgically demonstrated to be normally present. The lid elevation was bilateral, and connected with both jaw opening and closure. In the second patient the condition was unilateral. It showed the classical and usual picture of lid elevation associated with the action of the contralateral pterygoids.

The etiology and theories connected with the development of this syndrome were discussed, the cases illustrated by moving pictures, and the surgery for the correction of the syndrome presented.

*Discussion.* Dr. F. C. Grant said that the identity of the pathways over which the afferent or efferent fibers pass to produce this phenomenon is so definitely shrouded in mystery that it is unnecessary to go into a discussion of this aspect of the subject. Drs. Lewy and Groff did some work on this subject which seemed to suggest that the first division of the trigeminal nerve has much to do with the phenomenon, but those experiments were not so conclusive as was expected. He said he was much interested in having an ophthalmologic opinion on the treatment of this phenomenon.

He recalled a case seen about five years ago which presented exactly the same features as those shown in Dr. Spaeth's second case, with the definite elevation of one eyelid on contralateral movement of the jaw, suggesting that the pterygoid innervation on the ipsilateral side was always involved, for when that muscle was moved, there was a corresponding elevation of the eyelid. It was suspected that if the movements of the pterygoid were interfered with, and it were impossible for the patient to move his jaw to the contralateral side, the upper movement of the lid might possibly be prevented. In this case, the third division was blocked on the right side with procaine, and it was found that the patient

could not move his jaw to the left, the motor root was paralyzed, and upward movement of his eyelid was abolished. The novocaine was reinforced with alcohol, and it was noted that, while 95 percent of the pterygoid function was paralyzed, the patient could still move his jaw about a quarter of an inch to the left. With that movement, or effort, the spasm was still present. Operation was then performed and the third division of the right fifth nerve was cut together with the motor root. Serious trouble was encountered because the patient had a postoperative hemorrhage that almost cost him his life. As a result of this complication, there was a complete paralysis of the motor fifth, and with that degree of paralysis he could not move his jaw to the left. Consequently, he had none of the associated movement. He recovered completely from the third- and seventh-nerve paralyses. Eight months following operative intervention there was slight evidence of the oculomotor weakness, but it was impossible for him to move his jaw to the left, and even with forcible movement of the jaw, there was none of the associated movement that had accompanied the contraction of the pterygoid prior to operative interference.

He stated that he would be reluctant to suggest operative intervention in the treatment of these cases, especially if it were going to involve the patient in the possible hazards consequent upon postoperative hemorrhage. Fortunately, this is a very uncommon operative complication.

If there is an ophthalmologic surgical procedure to offer these people, he said he thought that it would probably be preferred to that which he described. The only excuse for operating on this patient was the fact that, in going through the literature, he had found that there were 100 cases of Marcus Gunn phenomenon

and in none of these had any attempt at all been made to correct the associated movement. This was the 101st case, and the result has been seen.

Dr. William Zentmayer said that cases showing anomalous associated action of the muscles of the face and eye have been classified by Friedenwald as follows: (1) Contraction of the levator palpebrae superioris with the act of moving the jaw or swallowing. (2) Contraction of the orbicularis associated with movement of the jaw, or contraction of the various face muscles after facial paralysis. (3) Contraction of the levator palpebrae superioris associated with abduction or adduction of the eye.

To these he suggested the additional classification: Contraction of the frontalis associated with abduction of the eye.

The committee appointed by the Ophthalmological Society of the United Kingdom to investigate Gunn's case reported that the phenomena were to be explained by innervation of the levator both from the nucleus of the third nerve and the external pterygoid portion of the nucleus of the fifth nerve.

In Harlan's case, reported before the Section, there was rapid winking of the left eye during mastication, which gave the impression of a blepharospasm. It was an acquired condition in a four-year-old child and followed an attack of typhoid fever.

According to Harman and Topolanski elevation of the alae of the nose accompanies normal blinking of the eyes in 20 percent of persons examined. Harman's explanation of the Gunn phenomenon is that these cases represent atavistic anomalies as in the shark; the fifth and seventh nerves are so closely associated that they are called the "facial complex."

Fuchs has described a group in which the upper lid is raised in attempts at adduction and falls in abduction. The reverse

of this may also at times be observed. Usually there is associated ptosis, and there may or may not be paresis of the lateral muscle. Fuchs assumed that the excessive nerve energy that is supplied to the paralyzed nerve overflows into the neighboring nuclei.

He said he had observed contraction of the frontalis in abduction of the eyeball in a man, aged 20 years, who had an esotropia of 12 degrees, the right eye being used for fixation. There was some limitation of the outward excursion of the left eye. As the fixating object was carried to the left, the left eye stopped when it reached the midline, and the elevation of the left brow began as soon as abduction started and reached its maximum when the eye by forced action almost reached the external canthus. There was no accompanying elevation of the lid or widening of the palpebral fissure. There was neither ptosis nor palsy of any of the ocular muscles. The eyes were hyperopic. There was no evidence of organic disease of the nervous system.

In Wilbrand and Sanger's treatise on "Die Neurologie des Auges" a similar case is reported.

Dr. Francis Heed Adler stated that at this time it is probably fruitless to suggest another possible explanation of this interesting condition. It seems curious, however, that no one has called attention to the possibility of the cortical or subcortical site of the lesion. It is well known that the vast majority of these cases are associated with congenital ptosis. None of the ocular muscles are represented individually in the frontal cortex, with the exception of the muscles of the lid. The levator muscle is represented in the foot of the second frontal convolution adjacent to the representation of the muscles moving the jaws.

It seems quite possible, therefore, that a lesion or a lack of development of the

cells in this area could easily account for this phenomenon. At the present time, however, there is no evidence on which to base this hypothesis, but it seems plausible.

Dr. James S. Shipman said that he had seen the first case that Dr. Spaeth presented, and had asked Dr. Spaeth in for consultation. He at once made a diagnosis, and suggested the operative procedure which was followed. It is questionable whether this procedure will produce permanent results. As Dr. Spaeth had pointed out in his presentation, Marcus Gunn phenomenon is congenital, and the pseudo Graefe phenomenon is very often the result of similar anatomic possibilities, that is destruction of third-nerve fibers, which, with regeneration, result in misdirection, although in this instance this misdirection occurs within the trunk of the regenerating third nerve. The surgery for this, the pseudo-Graefe syndrome, is, in his opinion, the same as that required for the Marcus Gunn phenomenon. First the conversion of the case into one of paralytic ptosis by the surgical destruction of the levator and following this the correction of that paralytic ptosis. The abnormal movements which the patient develops in each of these types of pathologic associated reflexes are not greatly dissimilar. Such a case was seen not many months ago.

Dr. Spaeth had pointed out that in his opinion the basis of the Marcus Gunn phenomenon is a miscellaneous direction or abnormal regeneration of nerve fibers. Dr. Shipman said that the question in his mind is whether this patient three or five years from the time of operation will still have the same appearance that he has at present, and if he will still be free of this phenomenon of jaw-winking. He suggested that a few more years be allowed to elapse so as properly to evaluate the lasting effects of the procedure as followed in the cases presented.

Dr. E. B. Spaeth stated that the longest time a case so far had remained corrected was over four years. Apparently, this was a permanent correction. There is no reason to doubt the permanency of these results.

Dr. Grant's demonstration is certainly conclusive, as he showed. With regard to Dr. Adler's discussion he said he does not believe that the Marcus Gunn phenomenon is one of cortical stimulation, even though Walsh's patient, who developed a lid elevation when he became interested in an attractive member of the opposite sex, and another youngster who developed an elevation of the upper lid when he became angry, do suggest a cortical relationship.

#### PRECIPITOUS DEVELOPMENT OF OPTIC NEURITIS AND CATARACTS IN A CASE OF HYPOPARATHYROIDISM

DR. WALTER I. LILLIE presented a case of bilateral optic neuritis and precipitous cataractous formation associated with postoperative hypoparathyroidism.

From the ophthalmologic aspect, this patient presented many interesting features. First, she had had a mild exophthalmos since the age of 10 years, which had not changed in character throughout the entire course of the condition.

Second, blurring of vision associated with acute bilateral optic neuritis, developed precipitously two months after thyroidectomy, but well in advance of any of the clinical signs such as the dermatitis and tetany associated with convulsions.

Third, at the time of the first examination at Temple University Hospital, the lens in each eye showed only a few small discrete opacities in the cortex anterior to the posterior capsule. Opacifications were so slight that the fundus examination was not interfered with in either eye. Definite edema of the disc was visible with the ophthalmoscope. The ocular examina-

tion at this time revealed a classical optic-neuritis syndrome.

Fourth, the rapid development of cataracts to maturity and hypermaturity in the course of 10 days' stay in the Hospital was of extreme interest. Unfortunately, it stopped any possibility of fundus examinations to see how the optic neuritis was responding to general treatment.

Fifth, following successful cataract extraction in each eye, the fundus examination was negative, and the visual acuity normal.

*Discussion.* Dr. Charles L. Brown called attention to the fact that in this case the general condition was a very complicated one, manifested by a very extensive metabolic disturbance. He was inclined to think that besides a severe chronic hypoparathyroidism there was also diminution of thyroid function. There was also reason to believe that a nutritional deficiency entered into this picture.

The last-mentioned point is not clearly understood, but it is apparent in other cases that have been reported. In one particular case, which he reported in collaboration with Dr. Norman Learner, there was evidence of nutritional deficiency, particularly of vitamin B. It was also believed that vitamin-D deficiency might be a factor. This case showed indications of skin manifestations during the part of the year when the patient was not exposed to the usual amount of sunshine. It is interesting to note that many of these ectodermal changes that have occurred in connection with postoperative thyroid and parathyroid conditions seem to have been particularly prevalent in those patients who were operated on between January and May. When referring to the hypoparathyroid state, it is natural to turn to the disorders associated with calcium and phosphorus metabolism. How much this widespread metabolic disorder has to do with the formation of cataract

with the occurrence of other ectodermal-tissue changes, one can only speculate.

It is not particularly rare for cataracts to occur as one of the manifestations or features in chronic tetany. In past years it is apparent in the literature that the occurrence of cataracts is recognized as being quite frequent in the nutritional tetany of young adults. Those who have described such cataracts have called attention to the characteristic subcapsular distribution of these opacities. There has been some indication that cataracts occur rather rapidly. In 1941, in one of the cases reported by Emerson, Walsh, and Howard, there is said to have developed a bilateral-cataract formation which led to complete blindness within  $4\frac{1}{2}$  months. One of the very interesting, and perhaps significant, points in this case is the rapid appearance of cataract, as Dr. Lillie stated, within 10 days while under his observation. It is interesting that AT 10, or dihydrotachysterol, plus calcium, has been an effective therapeutic measure as far as the calcium-phosphorus metabolism is concerned, and it would have been interesting to see if this substance impeded the progress of these cataracts had they not been so rapidly formed.

#### FOSTER KENNEDY SYNDROME WITH FUSIFORM ANEURYSMS OF THE INTERNAL CAROTID ARTERIES (BILATERAL)

DR. I. S. TASSMAN said that a married woman, 32 years old, suffered from pain over the eyes and loss of vision in the left eye over a period of eight months prior to coming to Wills Hospital. Other subjective signs and complaints were practically negative. Ocular examination when the patient was first seen by Dr. Tassman revealed the presence of a Foster Kennedy syndrome. There was papilledema of at least 3 diopters with good vision in the right eye, and optic atrophy with almost total loss of vision in the

left eye. The presence of a suprasellar lesion was suspected. Definite diagnosis was made at the time of operation, which revealed the presence of bilateral fusiform aneurysms of the internal carotid arteries with anomalous loop formation in the course of the arteries, and compression of the optic nerves. The case might be classed as one of congenital origin.

On admission to Wills Hospital, November 17, 1943, the vision was R.E. 6/6, partly; L.E. ability to see hand movements at 10 inches. The lid action was good. There was no nystagmus. Ocular rotations were full. The pupil, cornea, conjunctiva, and intraocular pressure were normal in each eye.

Visual fields of the right eye showed moderate concentric contraction of the peripheral field, and a slight enlargement of the blind spot. With the left eye there was ability to see hand motion just around central fixation.

Examinations of the ears, nose, and throat were negative. X-ray pictures of the skull and sella turcica showed no evidence of pathologic change. The sinuses were negative.

Results of laboratory studies were as follows: urinalysis, negative; blood sugar, 104 mg.; blood Wassermann, anticomplement; Kahn, negative; spinal-fluid pressure, 110 mm.; cell count, 0 cells; globulin, negative; colloidal gold curve, 0000000000 percent; total protein, 25 mg.; and Mantoux test, negative.

Findings from the neurologic examination suggested the presence of a suprasellar lesion either neoplasm or aneurysm, with the ocular finding of Foster Kennedy syndrome. Other localizing signs were absent. Air encephalogram was done on December 2, 1943, followed by a roentgenologic study which indicated a possible suprasellar lesion.

Craniotomy was performed on Decem-

ber 14, 1943, over the left frontal lobe. Just beneath the optic nerve of the left eye there was seen a fusiform aneurysm of the internal carotid artery, which after passing out of the skull formed a complete loop into the region of the sella, and then passed backward to its normal location to pass laterally to the middle cerebral artery. On the right side there was a similar fusiform aneurysm of the internal carotid with a mass of tiny veins on it just beneath the optic nerve. This pressed the optic nerve backward tightly against the optic foramen. It was impossible to do anything with the lesion.

Arteriography was done on January 14, 1944. The carotid arteries on the right side were exposed and 15 c.c. of 35-percent diodrast was injected rapidly into the internal carotid. The X-ray picture which was taken following this showed a tortuous internal carotid artery just beneath the optic nerve.

Craniotomy over the right frontal lobe was performed on January 19, 1944. The internal carotid fitted snugly beneath the optic nerve, and pressed it tightly against the upper edge of the optic foramen. The roof of the optic canal was removed for a distance of about one-half inch from the foramen.

On January 29th the vision in the right eye was reduced to 5/200, and the visual field showed considerable contraction in the entire periphery.

*Discussion.* Dr. Bernard J. Alpers stated that there was much difference of opinion in determining whether a Foster Kennedy syndrome was present in this case and whether the patient had an optic neuritis in one eye or an edema. He said he thought that this was an important point.

The aspect of greatest interest pertaining to the so-called Foster Kennedy syndrome is that there might be some clarification of the nomenclature with regard

to it. Somebody sooner or later begins to rise to a point of order with regard to nomenclature, and states that it is not the Foster Kennedy syndrome after all, and difficulties start on that score.

Another point is that thinking of the syndrome in question has become largely oriented toward diagnosis of tumor almost exclusively, so that if some other way of describing that subject could be found, such as alternating edema and atrophy, the ideas with regard to what might cause it would not become so fixed. He thought that unquestionably, in connection with this syndrome, a tumor is most frequently found in the suprasellar region, but it is not often recognized so that it may be associated with aneurysm and arteriosclerosis of the vessels of the circle of Willis. In connection with this, he said he had an interesting experience recently in a case which showed a typical Foster Kennedy syndrome with an edema in one eye and an atrophy in the other. This patient had had a head injury and some time later developed headaches and loss of vision. It was thought that he had a tumor. Visual fields showed a central scotoma in one eye, and a contraction of the visual field in the other eye. A pneumogram revealed nothing of note. Operation disclosed a very firm arachnoiditis covering the entire optic chiasm and both optic nerves. Because there was some bulging over the third ventricle, this was explored, and nothing was seen within it. In this instance it could be stated without hesitation that the Foster Kennedy syndrome was due to arachnoiditis. He believed that as more examples of this type of syndrome are seen, more causes will become evident.

Dr. W. I. Lillie showed four lantern slides, illustrating various vascular anomalies of the anterior portion of the circle of Willis producing prechiasmal syndromes.

These anomalies push the optic nerves upward and forward against the bony roof of the optic canals. This continued pressure produces the typical prechiasmal syndrome as described by Dr. Tassman. The operative procedure to relieve pressure is restricted to removing the bony roof of the optic canal, for the vascular anomaly usually prohibits any surgical interference.

Dr. Tassman, in closing said with reference to the differential diagnosis between papilledema and optic neuritis, that the patient he discussed arrived with a diagnosis of optic neuritis in the right eye. He said he never felt that the condition in the right eye was anything other than a papilledema, particularly because of the presence of good central vision. If it had been an optic neuritis the central vision would have been much less than it was found to be, practically normal.

Also, there was almost a complete absence of inflammation about the nerve head or vessels. These are the two principal distinguishing features.

George F. J. Kelly,  
*Clerk.*

## CHICAGO OPHTHALMOLOGICAL SOCIETY

February 21, 1944

DR. VERNON M. LEECH, *president*

### CLINICAL MEETING

(Presented by the Department of Ophthalmology, University of Illinois)

### ARTERIOVENOUS ANGIOMA, BASILAR ARTERY

DR. HIRAM J. SMITH said that F. W., a man aged 33 years, was seen on March 8, 1943, complaining of continuous persistent headaches since the summer of 1939. At that time a complete general and neurologic examination had brought



negative results. Accompanying the headaches were staggering, fainting spells, yawning, and hiccupping, especially during the past three months; periods of blurred vision and diplopia; some nausea and vomiting but no stiffness of the neck.

On admission the patient was ambulatory, slightly dysarthric, and related his story clearly and coherently. His response was slightly sluggish, but always accurate. He gave a history of gonorrheal infection in 1938 and 1941, which was adequately treated both times. On examination a positive Romberg sign was found, with tendency to fall backward to the right; ataxic gait, hypotonicity throughout the entire left side of the body; rebound phenomenon on left side; and slight pyramidal-tract signs on the left side with increased reflexes.

Examination of the eyes showed slight hypesthesia of the corneal reflex of the right eye and bilateral papilledema with hemorrhages of the retinal type. There was questionable slight lower facial weakness on the left side, and an auscultatory bruit over the suboccipital region bilaterally, slightly more pronounced on the left side, and tenderness over the left suboccipital region. Caloric tests were negative.

On March 11, 1943, a suboccipital craniectomy and exploration of the posterior fossa were done, at which time it was found that there was a subdural clot, but this could not be definitely localized. Many large vessels were present, which seemed to be "hemangioma-bound." The pressure remained up in spite of repeated spinal taps, producing xanthochromic fluid and increased spinal-fluid proteins. Deep X-ray therapy procured no improvement. Subsequent ventriculography revealed considerable dilation in the ventricles and some air in the cisterna magna. There was communication with the lumbar space.

A needle was placed in the third ventricle for eight days, followed by a draining catheter between the posterior end of the third ventricle and the cisterna ambiens. Recovery was uneventful and the pressure remained low.

Because of the complaint of poor vision, the patient was referred to the eye department on January 13, 1944. He stated that he had to move his head to see clearly. On examination no pathologic findings were revealed. Visual fields showed only slight constriction for red, not characteristic of any lesion. Under homatropine, a weak compound hyperopic correction did not improve his vision, which was R.E. 1.0-3; L.E. 1.0-2.

#### SURGICAL RESTORATION OF SOCKET

DR. CARL APPLE presented M. H. W., who was seen for the first time in January, 1935, when she was 31 years old. Her right eye had been enucleated at the age of five years and she had worn a prosthesis since that time. The socket was beginning to contract and the prosthesis did not fit. During 1935 the following procedures were carried out: canthoplasty; plastic surgery, incision of the conjunctiva on two occasions; implantation of dental molding compound; excision of scar tissue followed by dermal graft; and cauterization of proliferating conjunctival tissue by diathermy.

In 1936, the patient had difficulty in inserting the prosthesis and exuberant hair was removed from the socket and exuberant granulation from the upper lid, as well as proliferating conjunctiva from the upper tarsal border. Electrolysis was done on the hair in the socket.

In 1938, a dermal graft was excised and a mucous graft, 2 by 3 cm., was taken from the lower lip, placed in the socket, and held by a pressure bandage. This was followed by granulation tissue filling in the socket. During 1939 the socket was very painful with progressive shrinking

and purulent discharge, and by 1940, adhesions of lower and upper lids had completely obliterated the socket.

Further surgery was impossible at the time because of the patient's pregnancy, but in October, 1943, the socket was restored according to the Wheeler technique. The graft was taken from the inner aspect of the thigh with a Pladget dermatome. The mold was made with dental compound.

#### CHRONIC OPHTHALMOPLÉGIA EXTERNA, INFLAMMATORY

DR. ROOSEVELT BROOKS presented R. H., a girl aged six years, who was seen on January 11, 1944, with a complaint of drooping of the upper lids for three years, also tilting of the head backward. Shortly after an attack of whooping cough at the age of three years, the lid of the left eye began to droop, and six months later the lid of the right eye became affected.

The vision was R.E. 0.3; L.E. 0.1. The palpebral fissures were about one-third normal size. No movement of the lids upward was possible. There was apparent paralysis of all extraocular muscles; only slight twitching movements of the eyeballs were obtained. The right eye appeared to be almost straight in the primary position and the left diverged about 25 degrees. The pupils reacted to strong light. The discs and tension were normal.

Refraction under atropine revealed: R.E.  $-0.75D.$  sph.  $\approx +1.50D.$  cyl. ax.  $90^\circ$ , vision 0.3; L.E.  $-1.25D.$  sph.  $\approx +1.75D.$  cyl. ax.  $90^\circ$ , vision 0.1. Both eyes appeared to diverge. The visual fields were normal. There were no other neurologic findings.

Fagin, in his classification of causes of ophthalmoplegia externa, stated that meningitis secondary to an acute infectious disease develops and affects the nuclei in the floor of the fourth ventricle. Oppenheimer stated that most cases of

chronic ophthalmoplegia represent prodromata or local manifestations of central-nervous-system disorders, such as tabes dorsalis, general paresis, and multiple sclerosis.

#### CONGENITAL ECTOPIA LENTIS, BILATERAL

DR. M. H. CUTLER presented C. K., a 28-year-old white man, who stated that he had had poor vision since infancy. He had worn glasses since childhood, had had frequent headaches and persistent diplopia. A younger sister, it was said, had the same ocular disturbances.

The vision was R.E. 2/200, with correction 0.4+2; L.E. 1/200, with correction 0.4-1. In testing the near point, the left eye diverged. The lenses were displaced medially in both eyes. Ophthalmodiaphanoscopy revealed a picturesque halo of both lens peripheries. Iridodonesis and tremulous lenses were present. On slitlamp microscopy of the left eye, a thin, threadlike opacity in the anterior cornea was seen to arch from the 3- to the 9-o'clock position across the width of the cornea. There was prolapse of the anterior vitreous membrane against the endothelial surface of the cornea. The zonular fibers were greatly elongated and stretched, and laterally the anterior portion of the vitreous was readily discerned. The left eye was similar except for the corneal finding. Ophthalmoscopy showed a normal fundus of dimensions seen in aphakia.

#### RETINITIS PIGMENTOSA, OR SECONDARY PIGMENTARY DEGENERATION OF THE RETINA

DR. ROY O. RISER presented N. E., a Negro, aged 29 years, who complained of failing vision for 15 years, although he was able to finish high school.

The vision was R.E., 0.8; L.E., 1.0. Refraction revealed emmetropia. The visual fields showed tubular vision; the diameter of the field of the right eye was

15 degrees, that of the left 20 degrees. No color field was obtainable. He had an intermittent fine nystagmus. The lenses were normal, the pupils reacted to light and accommodation. Both optic discs were very white. All the retinal arteries were thin white cords. The retinal veins were attenuated but patent. The maculas were clear, but starting within 1 disc diameter of the maculas and the discs were heavy clumps of pigment in bone-corporuscle pattern. This pigmentation did not extend beyond the equatorial zone but there was no peripheral field of vision.

Although all available tests had been made no trace of a contributing disease had been found.

#### SCIENTIFIC PROGRAM

##### NOTES ON AN OPERATION FOR GLAUCOMA

DR. ROBERT J. MASTERS presented a paper on this subject which has been published in this Journal (1944, v. 27, Dec., p. 1371).

*Discussion.* Dr. Earle B. Fowler stated that Dr. Masters stressed two points well worth consideration; the scratch incision, and the freeing of adhesions between iris and cornea.

The root iridectomy dates back to Graefe's article in 1857. Few therapeutic measures have remained permanent over so long a period of years. Dr. Masters's operation assures a basal iridectomy; possibly he tears the root free in some cases, producing a small localized iridodialysis before cutting, a procedure recommended by Török and several others. The scratch incision can be so accurately placed as to make this complete freeing of the root a certainty.

The scratch incision was described by Elschnig under the name sclerectomy, suggested by Salzmann. Homer described it under the name iridectomy ab externo. The procedure can be carried out with al-

most any instrument, even a rigidly held needle, and is the safest manner of opening the anterior chamber when that chamber is shallow. The wound gaps advantageously.

As to freeing the adhesions, Jervoy found that they could be broken to an appreciable distance beyond each end of the wound. He even used a small curette to remove the adherent iris tissue from the pectinate ligament. Dr. Masters, in observing his cases, may be able to see just how far he has freed adhesions; as he sweeps the spatula to the side he may not produce separation of the ciliary body from the sclera, but may, with a blunt instrument, open the spaces of the ligament as Barkan does with a sharp one.

Dr. Hiram J. Smith said he had started using this technique in 1923 and found it worked very well. In making the incision through the sclera by scratch method, as described by Dr. Masters, it is helpful to watch for the dark color of the ciliary tissue, and thus avoid breaking through or penetrating the uveal tissue.

While he had performed a number of these operations, his results were not reported because Holth of Oslo came out with an article on the same surgical procedure about 1925, before his own series was ready to be reported. He had combined cyclodialysis, sclerectomy, and peripheral iridotomy. Sclerectomy was at first performed with a cataract knife, later more easily with a scleral punch forceps. Holth showed why this type of operation was successful. He recovered eyes *post mortem* from patients who had had the operation, and showed on section that the edges of the sclera became epithelialized from the uveal tissue and the opening therefore did not close. This type of operation seldom has to be repeated, but does provide permanent drainage.

Dr. Samuel J. Meyer stated that these

operations for glaucoma always present several factors for consideration when a combination of cyclodialysis and iridectomy is performed, in that two operations are performed at one time. Following Wheeler's advice to make a cyclodialysis at 90 degrees and an iridectomy at 60 or 120 degrees, he had tried about a dozen, but had trouble in making a keratome incision because the eye got too soft following the first part of the procedure. Success of the operation depends upon the location of peripheral anterior synechiae. If a gonioscopic examination was done and it was found where peripheral anterior synechiae were, surgical procedure could be avoided in these areas and better results obtained.

He asked the incidence of cataracts in Dr. Masters's series. They are sometimes unavoidable in glaucoma surgery, and he wondered what chance there was of injuring the lens following such a small incision with the insertion of iris forceps. Also, in these aphakic eyes, was there loss of vitreous at the time of operation? It has been thought that cyclodialysis is indicated in such cases because it can be done with the least trauma. Are the results in acute congestive glaucoma as good as in the noncongestive or chronic simple type?

Dr. Thomas D. Allen said that the insidious hypertension which so frequently follows cataract surgery is, as Dr. Masters has recalled, often found early only by frequent postoperative examination of aphakic eyes for at least two years. In the examination not only the trial case, slit-lamp, tonometer, and gonioscope must be used, but repeated visual-field studies should be made, especially the central fields on a tangent screen. By using the gonioscope critically, the results of the surgical technique can be studied. Dr. Masters emphasized the position of the

limbal incision so placed that it will enter the chamber immediately in front of the iris in the area of the canal of Schlemm. When any instrumentation is done in the chamber, one must be careful of the endothelium to avoid peripheral adhesions which may render surgery futile. As in all eye surgery, the less trauma to the tissues the better the surgical result. This should be emphasized.

Dr. Masters also stressed the importance of massage following glaucoma surgery, to keep open the filtering passageways to the episcleral spaces and avoid a cystoid bleb.

There is a question as to whether there may not be injury to Descemet's membrane and the endothelium in Dr. Masters's operation. If this occurs, is air injected into the chamber just as the toilet of the wound is finished, to keep the iris away from the cornea until the endothelium re-forms? A small incision is better than one that is too large, but too small an incision may interfere with accurate manipulation of the tissues.

Dr. Robert Masters, in closing, said that with an iridencleisis to aid in the establishment of drainage, as mentioned by Dr. Fowler, more is accomplished than by freeing only a small segment of the chamber angle as with an iridectomy. In some of these eyes examined gonioscopically it has been apparent that not only an iridectomy but an iridencleisis had been accomplished, because there was some iris tissue in the wound; therefore a doorjamb effect had been achieved with only a peripheral section of iris at the edge of the coloboma. However, an iridencleisis may be satisfactorily accomplished through the scratch-incision approach, as described.

With reference to cyclodialysis, he said he believed that in aphakic eyes it would be better not to make the type of ap-

proach he had described, requiring as many as three operations to bring and keep the tension down, but rather to perform the classical cyclodialysis operation.

Dr. Fowler mentioned freeing the angle by a spatula. He had entered the anterior chamber angle with the spatula with the intention of breaking up the meshwork of the iris angle; however, it appears that the meshwork probably heals together and the result is not permanent. He thanked Dr. Smith for mentioning the modification of this operation. The difficulty of accomplishing the keratome incision is the reason for the scratch incision. In two eyes there were subsequent cataracts which possibly could be blamed on the procedure. He had endeavored to hug the inside of the sclera and keep between the sclera and the ciliary body, and between the cornea and iris, thus avoiding injury to the lens. This, in turn, leads to the danger Dr. Allen mentioned, of traumatizing Desemet's membrane. Gonioscopic examinations have disclosed such trauma in two eyes recently observed, although the function of the eyes did not seem to be disturbed.

In acute congestive glaucoma and chronic glaucoma the relative results and failures have been approximately the same. He had had to repeat them on both types, and the reason could probably be explained by examination of the chamber angle, in that the first operation did not open enough chamber-angle circumference.

The time when finger massage is begun depends more or less on tenderness of the eye. He said he had not used air injections although it certainly is rational. The small scleral incision may be due to timidity. He made it longer when he found he could not easily grasp the iris.

## THE CLINICAL SIGNIFICANCE OF THE pH OF SUPERFICIAL MUCOUS MEMBRANES OF THE HEAD

DR. NOAH D. FABRICANT presented a paper on this subject.

*Discussion.* Dr. Arlington C. Krause said that the first paper on the subject of Dr. Fabricant's research was published in 1791. Up to the present time 107 available primary papers have been published on human conjunctival fluids; of these, many are concerned with the pH of conjunctival fluids.

The pH of the fluid on the mucous membranes of the normal eye is unknown. The mucus of the conjunctiva is acid. The amount of secretion of the tear glands is apparently just sufficient to keep the conjunctiva moist but the pH of that unknown amount of tears is questionable; this is particularly true of the pre-tearing baby and of the xerotic senile. The normal tears have a pH around 7.3, varying from 7.2 to 7.5 in adults. The effect of pH on lysozyme of the tears, the enzyme which splits mucus and breaks up mucus-bearing bacteria has not been studied. Psychic tears tend to become more alkaline. The Japanese stressed the hardening effect of alkaline tears on meibomian infarcts.

The pH of the conjunctival fluids has a bearing on ocular disease. Purulent conjunctival secretions are usually acid; that is, they have a pH below 7. The bacteria and leukocytes form acid rapidly and lower the pH of the fluids.

Normally tears contain little or no glucose unless the blood sugar is high. In patients suffering from diabetes and after ingestion of much sugar, glucose is present, and is an excellent medium for purulent bacteria and for acid production. Many of the enzymes in dead leukocytes and bacteria are mainly active in acid media. Certain types of erosions may be explained on this basis.

The pH of fluids applied to the conjunctiva is important in many ways. The pH of solutions of drugs, particularly alkaloids, affect the absorption and solubility of the drug; many specific factors other than pH enter here, however. Ionized drugs may be driven into the eye. One drug is penicillin, which is acid. With a direct current, the hydrogen ion goes to the cathode and acid ion to the anode. By placing the cathode over the cornea and the anode over the neck the acid ion or penicillin may be driven into the eye to give a high concentration. The effect of extremely high or low pH, as in alkaline and acid burns, may be great progressive damage; hydrofluoric and iodoacetic acids are examples of extremely toxic acids.

The pH of conjunctival fluids is related to the use of contact glasses. In general,

slightly alkaline solutions are most comfortable to the cornea and conjunctiva. Clouding of the corneal fluid is affected by the instability of the patient's tissues, loss of carbon dioxide, precipitation of phosphate and mucus, growth of bacteria, irritation of epithelium and formation of mucus, and changes in the tonicity and osmotic properties of the fluid. The contact fluid may be osmotic and not isotonic with the cornea. The pH is only one of the factors involved in these changes. The pH of the conjunctival fluids is just a part of the chemistry of tears, mucus, and Harderian, meibomian, and other glands.

The field of investigation on the surface fluids of the eye is wide open. The work is not involved and the results will lead to better treatment of external ocular diseases.

Robert Von der Heydt.

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## LOCAL OPTION IN OPHTHALMO- OPTOMETRIC RELATIONS

One fact stands out clearly in the confusing ophthalmic-optometric problem, and that is that ophthalmologists have never been able to find a satisfactory solution. This is well illustrated by the actions of the ophthalmic Section of the American Medical Association at the business sessions of which diametrically opposite resolutions have been passed within one year's time. Apparently no general agreement is possible. The actions taken have been at meetings attended by less than 10 percent of the membership of the Section and seem to have been

colored considerably by the locale from which the audience has been drawn and are not surely representative of the desires of a majority of the entire group.

The trustees of the American Medical Association recognized the apparent inability of the Section to solve the problem and appointed a committee specifically to consider certain questions asked by a national association of optometrists. This committee, realizing the complexity of the problem and the misunderstandings certain to ensue from correspondence without direct contacts at round-table discussions with representatives of the optometrists, reported to the trustees

that in their opinion discussions of the subject would be futile unless they were permitted to deal directly with the optometrists. The trustees, doubtless influenced by the resolutions of the Section in regard to these matters, were unwilling to give this permission and so disbanded the committee at its own request.

Dr. Conrad Berens, in his Chairman's Address to the Section at the meeting in 1944, made the suggestion that the problem could best be handled by turning the matter over to the individual states to let each decide how its ophthalmologists chose to handle this touchy question. This seems like a sound suggestion, because the problem very definitely varies in different parts of the country and because adequate authority is vested in state organizations by the American Medical Association for such action. This could then be done in a manner acceptable to the ophthalmologists in each locality.

It seems obvious that optometrists will continue to perform a large percentage of the refractions in America and will always be interested in matters that concern ophthalmologists also. It is evident that the better educated the optometrist the more capable will he be of performing well his functions as a refractionist. The standards of optometry have been continually raised in the past two or three decades and there is every indication that the leaders in this group will consistently strive for further education for optometrists. That this calling has many in its ranks who attempt to perform functions far exceeding their training is undoubtedly true. Some of them attempt to eliminate the ophthalmologist from the medical picture by referring patients directly to internists, and are actively hostile to ophthalmologists and in many ways offend the ideals of this group, but this seems to be particularly prevalent in some sections of the country, whereas in others

the relationship of the two groups is satisfactory. In the Armed Forces, both in the Army and in the Navy, ophthalmologists and optometrists have worked together to the satisfaction of both. Many of the writer's former students have been closely associated with optometrists in their work in World War II and have written of cordial coöperation by them, and in many instances have expressed praise for their excellent work. It would seem a pity not to take advantage of this friendly association in arriving at a better understanding between the two groups in general.

If a resolution were passed by the Section, as suggested by Dr. Berens, referring the matter back to the individual states, undoubtedly there would be some states in which regulations liberalizing ophthamo-optometric relationships would be passed and in which ophthalmologists would be allowed to give courses in medical subjects to groups of optometrists and in schools of optometry (as has been done repeatedly despite the rules to the contrary that have existed for many years). On the other hand, there would be localities in which the most stringent restrictions would be passed, and many states in which no action would be taken at all and the matter allowed to rest as it now is. The writer has had a satisfactory association with optometrists serving as technicians in aniseikonia for many years and during the past year in a research project on the training of visual skills in an attempt to improve myopia undertaken jointly with optometrists because it was thought that this idea, sponsored largely by optometrists, could best be evaluated by working with them. A report on this research will soon be available to the profession.

It is true that the optometric background has not been comparable with that of ophthalmologists and that there have



been and still are optometrists who are not in sympathy with their leaders who have striven and are still striving for improvements, but no one who has studied the subject even superficially can doubt that much progress for betterment has been made in the past quarter century. Nor can anyone who has had occasion to meet and confer with the best men in optometry fail to appreciate their earnest purpose.

The writer would be in favor of a resolution turning the entire matter back to the state medical organizations, as he believes that more ophthalmologists would come nearer having the type of relationships with optometrists that they desire through local rules than by any general ruling from the American Medical Association. The writer hopes that the resolution will be presented and can be made available for study by the membership of the Section sufficiently in advance of the next meeting so that members can inform themselves on the matter and express their desires by their votes on the resolution. He would also suggest a poll of the membership of the Section on the resolution before the meeting to determine the reaction of the entire membership rather than that alone of the small percentage that will attend any business session.

Lawrence T. Post.

### THE NATIONAL SOCIETY FOR THE PREVENTION OF BLINDNESS

The average citizen has little personal contact with the misery which exists in his vicinity. Misery, except of the more or less professional variety which in more peaceful days was on display in various European countries, tends to hide itself. The most unfortunate types of blindness are seldom conspicuous to the public eye.

Financial aid for the unfortunate is not all that is required. Many state and municipal agencies exist for this purpose. But voluntary organizations play an important part in arousing the public conscience, not merely to the existence of misfortune but to the need for preventing its increase, and to those educational methods which may improve the daily living conditions of the blind and others who for one reason or another are not in possession of normal faculties.

The blind especially need guidance and education as to ways in which their lives may be made to experience the fulness of interest and activity enjoyed by the normal citizen. In stimulating public interest as to these possibilities, national organizations of a voluntary character have done much. In the United States, especially valuable as regards the function of vision has been the National Society for the Prevention of Blindness.

This Society was founded by a small group thirty years ago in New York City as an expansion of the New York State Committee for the Prevention of Blindness. It now counts a membership of thirty thousand. It undertakes a considerable variety of activities, some related to the actual prevention of blindness, others concerned with the detection of defects whose recognition may lead to remedial action.

When the Society was founded, its most important immediate aim was to reduce the incidence of ophthalmia neonatorum, which was then a major cause of blindness among children admitted to schools and institutions for the blind in the United States. The number of such children thus disabled has now been reduced by 75 percent. Thirty years ago there were only a few sight-saving classes: the number of these has grown to 613. Partly as the result of the activities of the National Society for the Pre-

vention of Blindness, there has been great multiplication and improvement in industrial programs for the conservation of vision.

In the past few years the Society has interested itself especially, not only in the protection, but also in the more effective utilization, of sight in industry; and in the control of glaucoma by early diagnosis, by determination of the best methods of treatment, and by efficient follow-up of patients in the public clinics.

The war has brought its special developments in the activities of the Society, which was called upon to participate in the War Production Board's drive for speeding up production through improvement of visual conditions in the war industries. In this connection the Society prepared, and has circulated to 7,500 industrial plants, the "Manual and Appraisal Form on Conservation and Utilization of Eyesight in Industry."

As regards the purposes expressed in the title of that form, much remains to be accomplished. Information so far furnished on the basis of the form indicates that only 61 percent of the plants make the pre-placement tests necessary for correct job assignment; that more than 75 percent of the plants in which the tests are made do not have the testing done under the direction of an eye specialist; that more than 85 percent of the plants fail to make a periodical recheck of the vision of their employees; that more than 80 percent fail to recheck the vision of workers who are exposed to special hazards; that 92 percent neglect to recheck vision of employees who show poor production records; that 83 percent neglect to recheck vision of workers involved in accidents; and that 73 percent neglect to recheck employees whose original visual test indicated a need for follow-up.

The National Society for the Preven-

tion of Blindness has conducted, or has coöperated in conducting, several instruction courses. One of these was aimed at the training of additional industrial ophthalmologists; another, held in connection with the annual meeting of the American Public Health Association, was in the nature of a conference of nursing consultants, supervisors, and instructors whose duties had to do with the nursing care of eyes in industry.

The Society recognizes the need for further development of the program for sight-testing, not only in industry but in the schools. The present machinery for investigating the vision of school children and older children is usually inadequate for the detection of such defects as do not produce marked visual deficiency. Thus a child or student may have a disturbing amount of hyperopia or astigmatism, or significant inequalities of refraction as between the two eyes, without being recorded as in need of professional attention. Only in limited areas of the country has this fact been recognized by the adoption of special training for those engaged in making the necessary school examinations, and in provision of equipment more completely suited to the purpose than the mere recording of uncorrected vision of the Snellen chart.

The Society's outstanding achievements for the prevention of blindness and conservation of vision have been rendered possible by the loyal work of officers and directors and an executive staff which labors with zeal and understanding toward fulfillment of the Society's objectives. The Society's Executive Director, Mrs. Eleanor Brown Merrill, last year became President of the National Health Council; and a volume by the Society's Associate Director, Mrs. Winifred Hathaway, entitled "Education and Health of the Partially Seeing Child," has gone into a second edition in the

United States, while a separate edition of this work has been published in England. Miss Isobel Janowich is the earnest and capable editor of the Society's monthly publication "The Sight-Saving Review."

W. H. Crisp.

## CORRESPONDENCE

### THE TRACHOMA INCLUSION BODY

April 29, 1945

The Editor,  
American Journal of Ophthalmology:

The important article by Arnold Loewenstein entitled "Trachoma virus and the morphology of inclusion bodies," which appeared in the March, 1945 issue of your Journal, is of much interest. In my opinion, however, it gives the reader the impression, through the omission of certain essential references, that much less is known about the trachoma inclusion body than actually is the case.

Professor Loewenstein fails to mention that trachoma virus is a member of the psittacosis, lymphogranuloma-venereum group of viruses, a group about which much is known, particularly as to the elementary-body-initial-body cycle of morphologic variation which is characteristic only of the inclusions of this group. Tissue-culture studies of psittacosis and lymphogranuloma venereum have shed much light on the inclusion bodies of this entire group, and there can be no doubt but that the initial body represents the early intracellular phase of the virus and the elementary body the late intracellular phase.

In his opening paragraph Professor Loewenstein states that "inclusion bodies that are microscopically indistinguishable from those found in trachoma are found in other conjunctival diseases." This is certainly misleading, since indistinguish-

able inclusions are found only in inclusion conjunctivitis, a related virus disease which is also a member of the psittacosis, lymphogranuloma-venereum group. Professor Loewenstein's comment may be referable to the early confusion over inclusion conjunctivitis which was formerly considered as three separate diseases (inclusion blennorrhea, swimming-bath conjunctivitis, and acute follicular conjunctivitis with inclusions) but is now known to be one etiologic entity, or possibly to the reported findings, now known to be false, of similar inclusions in vernal catarrh and in hog cholera.

Professor Loewenstein rightly states that "trachoma is not a disease restricted to the epithelium" but fails to consider the probability that the virus itself remains strictly epithelial. As had previously been done by others, the writer repeatedly inoculated baboons, later proved susceptible by epithelial inoculation, through the skin of the lids, placing the virus subconjunctivally in the fornices. Infection has never been obtained by this route. The writer has also searched repeatedly for inclusions in the subepithelial tissues and has never been able to find them. These findings are in accord with the theory that trachoma virus is strictly epitheliotropic and produces subepithelial changes by the liberation of soluble toxic substances. This theory is strengthened by the fact that soluble toxic products have been demonstrated for the related viruses of lymphogranuloma venereum, meningopneumonitis, and mouse pneumonitis by Rake and his associates (Geoffrey Rake and Helen P. Jones. *Jour. Exper. Med.*, 1944, v. 79, p. 463).

No consideration of the trachoma inclusion body is complete without mention of the very important work of Rice (*Amer. Jour. Ophth.*, 1936, v. 19, p. 1)

who demonstrated the presence of a carbohydrate matrix for the trachoma inclusion body. This matrix is always present in the mature inclusion body and its demonstration should always be a part of any study of inclusions of uncertain nature. The writer has demonstrated to his satisfaction that no carbohydrate-containing inclusions are present in the subepithelial tissues in trachoma.

The various studies which have been made of the closely related virus-disease inclusion conjunctivitis also shed much light on the trachoma inclusion, since in this harmless disease many human inoculations have been possible. Thus in this disease it was demonstrated by the writer that the inclusion body requires about 48 hours for its intracellular development, a finding which is identical with the finding in psittacosis and which is probably applicable to the inclusions of the entire roup.

Most of the references discussed in this letter may be found in my review, "Viruses and virus diseases of the eye," which appeared in the Archives of Ophthalmology, 1943, v. 29, March, pp. 488-508, and 1943, v. 29, April, pp. 635-661.

(Signed)

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#### DISCUSSION OF HERING ON VISUAL DIRECTION

April 25, 1945

Editor,

American Journal of Ophthalmology:

The teachings of Hering and his school have been so often misrepresented in the recent literature dealing with binocular vision that one gains the impression that the majority of authors have not ob-

tained first-hand information from the sources.

In an article entitled "A contribution to the theory of binocular vision supported by three cases of latent nystagmus," which appeared in the April, 1945 issue of the American Journal of Ophthalmology, Dr. Adolph Posner gives a brief account of Hering's theory. He states that, according to this theory, in binocular vision "the ((foveal) image is projected along the visual axis of a hypothetical, cyclopean eye, or binoculus," and that "in general, any pair of points on the two retinas that are projected in space along the same line, are corresponding points."

Neither statement is correct. According to Hering, each retinal element possesses an inherent relative directional spatial value. Experimental evidence has confirmed time and again the stability of these directional retinal spatial values. Corresponding retinal elements have the same relative spatial value, and object points imaged on them are seen in the same subjective visual direction. Nowhere does Hering state that retinal images, let alone retinal points, are projected along any axis. In fact, Hering's pupil, Hofmann, is quite specific on this point. He says (in "*Die Lehre vom Raumsinn*," in Graefe-Saemisch's Handbuch der gesamten Augenheilkunde, ed. 2, Berlin, 1925, v. III, chapter XIII, p. 236): "The fact must be especially emphasized that the theory of the visual directions does not imply that the retinal images are 'projected outward' from the median imaginary eye along the visual directions. The opinion is derived, just as the projection theory in general, from the erroneous assumption that the retinal images are first presented to the mind and that they are then somehow transposed into space. Actually, most people have no inkling that there is such a thing as a

retinal image. Not these images, but the sensations in subjective space are the primary experience. The visual directions are only a subsequent intellectual reconstruction of this immediate experience."

Hering's teachings are not so much a theory as a description and interpretation of phenomena observed under rigorous experimental conditions by means of methods which Tschermak has termed methods of exact subjectivism. It is strange to note that these most exact methods of observation are so often dismissed as "introspective" or "subjective" and therefore affected with an "inherent weakness" (Posner).

The fact that some objective points, though they may be widely separated in objective space, appear in the same subjective visual direction can be verified experimentally without any trouble. In order to be so seen, the object points have to be imaged on specified retinal elements which were named corresponding retinal elements. It was thus concluded and defined that corresponding retinal elements have a common subjective visual direction. How corresponding retinal points come to have a common subjective visual direction is not explained by the theory. To be sure, it is assumed that there is not only simultaneous stimulation, but also simultaneous perception in the act of fusion, but *in principle* there could also be a

rapid alternation or replacement (Verhoeff). Hering himself has expressed the idea that a rapid alternation may be the cause for the establishment of an anomalous correspondence; that is, the establishment of a common visual direction between *de norma* disparate points (Deutsch. Arch. f. klin. Med., 1899, v. 64, p. 17).

In any event, Dr. Posner's interesting observation regarding the stabilizing influence of the amblyopic eye on the fixating eye does not in itself support either Hering's teachings or Verhoeff's replacement theory. If Dr. Posner's explanation is correct that this stabilizing influence is a function of the peripheral retina (that is, presumably a peripheral binocular cooperation or fusion), then it can be interpreted in terms of any fusion theory one chooses to adopt.

It is, finally, noteworthy that Dr. Posner has observed in patients with anomalous correspondence a marked facility to judge depth binocularly as compared with monocular vision. This is not in accord with the general experience that patients with anomalous correspondence are unable to pass standard tests for stereopsis.

(Signed)

Hermann M. Burian  
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# ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

## CLASSIFICATION

- |  |  |
|--|--|
| 1. General methods of diagnosis                        | 10. Retina and vitreous                                |
| 2. Therapeutics and operations                         | 11. Optic nerve and toxic amblyopias                   |
| 3. Physiologic optics, refraction, and color vision    | 12. Visual tracts and centers                          |
| 4. Ocular movements                                    | 13. Eyeball and orbit                                  |
| 5. Conjunctiva   | 14. Eyelids and lacrimal apparatus                     |
| 6. Cornea and sclera                                   | 15. Tumors   |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries   |
| 8. Glaucoma and ocular tension                         | 17. Systemic diseases and parasites                    |
| 9. Crystalline lens                                    | 18. Hygiene, sociology, education, and history         |
|  | 19. Anatomy, embryology, and comparative ophthalmology |

### 1

#### GENERAL METHODS OF DIAGNOSIS

Eggers, Harry: Estimation of uncorrected visual acuity in malingerers. *Arch. of Ophth.*, 1945, v. 33, Jan., pp. 23-28.

Careful retinoscopic study should be made under complete cycloplegia. Slitlamp and ophthalmoscopic examinations should rule out opacities in the media and lesions in the fundi. Neurologic conditions that cause central scotoma are not detectable with the ophthalmoscope. The history, the circumstances surrounding the case, and the perimetric and tangent-screen plottings at varying distances will usually all aid in establishing a diagnosis of retrobulbar neuritis, toxic amblyopia, or interference with the visual pathways. In a normal eye, the uncorrected visual acuity can be estimated accurately if the approximate refractive error is known. The author produces tables which represent correlations and deductions made on the basis of over 6,000 refractions, on young adults of

both sexes, who had no reason for withholding the truth. Eyes with astigmatism of identical amounts show small, but definite, variations in uncorrected visual acuity depending on the position of the axis. Simple myopic and simple hypermetropic astigmatism of the same amount are associated with practically identical decreases of visual acuity. A certain correspondence exists between cylindric and spherical corrections for myopia. (3 tables.)

R. W. Danielson.

Somberg, H. M., and Ingham, H. V. A simple aphasia study. *New York State Jour. Med.*, 1944, v. 44, May, p. 1126.

The authors describe the plan as used by Foster Kennedy on the Neurological service at Bellevue Hospital for standard examination of an aphasic patient. The visual portion of the test includes the usual estimate of vision and visual fields. Recognition of objects is tested by first naming objects shown, matching objects with a written list, and recognition of colors.

Recognition of symbols includes first letters, then words and sentences. Motor function is tested by reading own writing, then by ability to cut out letters from a blank sheet. Copying is tested by writing first spoken and then written sentences. The form chart is given in the article.

Owen C. Dickson.

Williamson, W. P. Afterimage perimetry. *Arch. of Ophth.*, 1945, v. 33, Jan., pp. 40-42.

The phenomenon of afterimage has apparently not been utilized as a means of perimetry. By a technique here described the author tested the possibility that in a patient with a lesion of the central optic pathways, the afterimage might show a defect corresponding to the site and size of the area of damage.

He claims the following and other advantages for this method: It is not tiring to the patient or to the examiner. The patient is unable to look away from the fixation point, since the afterimage moves simultaneously with any shift of the eye. With a hand lamp the method is readily adaptable to the bed patient, who sees the afterimages on the ceiling. With a simple design of an object in each quadrant, the method can be utilized for children. It is time-saving, and can be utilized in routine examinations for the armed services. However, the method reveals only absolute field defects. (4 figures.)

R. W. Danielson.

## 2

### THERAPEUTICS AND OPERATIONS

Dunnington, J. H., and Von Sallman, L. Penicillin therapy in ophthalmology. *Arch. of Ophth.*, 1944, v. 32, Nov., pp. 353-361; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42.

The authors report in detail as to the

therapeutic effectiveness of penicillin in diseases affecting the eye. Mannitol-positive strains of *Staphylococcus aureus* were injected into a series of rabbit eyes. One eye was treated in various ways with penicillin; the second eye was used as a control.

Corneal baths were found to be of little avail; iontophoretic applications of penicillin to the cornea were beneficial if started six hours after inoculation, the benefit varying directly with the shortness of time elapsing between inoculation and treatment. Intralenticular and intravitreal injections were very effective in arresting endophthalmic disease processes. In the rabbit eyes, there was a certain amount of chemical or mechanical damage to the retina and lens. However, the authors assume that the relatively greater size of the human eye will protect it from such damage since the point of the needle can be placed at a greater distance from those structures. Several very interesting case reports are included. (References, 1 illustration.)

R. W. Danielson.

Knapp, F. N. Treatment of ocular tuberculosis. *Trans. Amer. Ophth. Soc.*, 1943, v. 41, pp. 442-489.

The author presents an excellent review of the literature on ocular tuberculosis for the past ten years, covering tuberculinotherapy, hemotherapy, chrysotherapy, phototherapy, radiotherapy, climatotherapy, and dietotherapy. He cites 11 cases of ocular tuberculosis receiving a variety of therapy. His findings add to the preponderance of evidence in favor of tuberculinotherapy and dietotherapy. (4 illustrations, bibliography.)

Carl D. F. Jensen.

Leopold, I. H., and LaMotte, W. O. Penetration of penicillin in rabbit eyes

with normal, inflamed, and abraded corneas. *Arch. of Ophth.*, 1945, v. 33, Jan., pp. 43-46.

The authors used rabbit eyes. The penicillin in solution consisted of 500 Oxford units of the sodium salt per c.c. of isotonic solution of sodium chloride. Penicillin ointment was prepared with a polyethylene glycol (Carbowax) base. The concentration of penicillin in the ointment was 500 Oxford units per gram of base. Four drops of the penicillin solution or 0.2 gm. of penicillin ointment was applied to the conjunctival sac once, and aqueous humor was withdrawn 15 minutes, 45 minutes, or one hour and 45 minutes after the instillation.

The authors review the literature in which the opinion has been expressed that damage to corneal epithelium by high concentrations of penicillin in solution may account for high concentration of penicillin in the aqueous humor after the corneal-bath technique. The corneas were abraded in these experiments not only to measure the absorbability of penicillin under such conditions, but also to test the influence of penicillin on the rate of regeneration of corneal epithelium.

The authors' conclusions follow: Penicillin in solution or ointment fails to penetrate into the aqueous humor of the normal rabbit eye after one local instillation, but penetrates readily in the presence of corneal abrasion or ulcer.

The concentrations thus obtained exceed the probable therapeutic level. It is not necessary to resort to iontophoresis, the corneal bath technique, or subconjunctival injection to obtain effective concentrations in eyes with infected corneal ulcer or corneal abrasions. The solution or ointment de-

scribed needs to be used only once every two hours in the cul-de-sac to maintain high concentration in the aqueous humor. Repeated applications of the solution do not significantly retard regeneration of corneal epithelium. (3 tables, references.) R. W. Danielson.

Malbran, Jorge. Some therapeutic principles and rules in ophthalmology. *Ophth. Ibero Amer.*, 1944, v. 6, no. 1, pp. 1-13 (in Spanish), and pp. 13-23 (in English).

This is a review of the literature of the last few years, and deals particularly with the following topics: vascular physiology, parasympathomimetic drugs, sympathicomimetic drugs. References are made to a number of investigators in the United States.

W. H. Crisp.

Sertorio Senna. Sodium nicotinate as a vasodilator in ophthalmology. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, March-April, pp. 197-198.

Sodium nicotinate was found to be superior to nicotinic acid because of its high solubility. Injections are painless and may be given subcutaneously, intramuscularly, or intravenously. Injections are followed by mild symptoms of vasodilatation. Dosage begins with 1 c.c. of a 1-percent solution, and is increased progressively until 12 to 15 doses have been given. Good results have been obtained in arresting the progress of affections of the retinal and cerebral circulation.

J. Wesley McKinney.

### 3

#### PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Ames, Adelbert, Jr. The space eikonometer test for aniseikonia. *Amer.*



Jour. Ophth., 1945, v. 28, March, pp. 248-262. (10 figures, references.)

Cushman, Beulah. Analysis of cases of aniseikonia. Arch. of Ophth., 1945, v. 33, Jan., pp. 9-12; also Trans. Amer. Ophth. Soc., 1944, v. 42.

The doubts set forth in an editorial by Crisp in the December, 1943, issue of the American Journal of Ophthalmology suggested the following presentation of and comments on cases of aniseikonia.

The first question was how large a proportion of the ocular difficulties apparently relieved by prescription for aniseikonia were capable of relief in another way; the second question, what proportion could have been relieved by more complete accuracy in refractive measurements without the aid of size lenses.

Since September, 1942, the present author has made the examinations for aniseikonia of the patients referred to the department of ophthalmology of the Northwestern University Medical School. A total of 117 such examinations have been made, and of this number 97 were complete enough to permit analysis. Sixty-one patients showed an appreciable amount of aniseikonia; 17 no aniseikonia; and 19 had such poor fusion that examination was impossible until after some form of muscle training. Iseikonic lenses were ordered for 24 patients, and of this number 14 stated that they had obtained complete comfort, with disappearance of their asthenopic symptoms. Three reported that the condition was improved and four noticed no improvement.

Cushman suggests that the answer to Crisp's question of how large a proportion of the ocular difficulties appar-

ently relieved by prescriptions for aniseikonia could have been relieved if the patients had worn careful refractive corrections first is answered by the results with the patients who were made comfortable with the iseikonic lenses, since the majority of these patients had worn the same prescription for their refractive correction before size magnification was added. It is to be pointed out, also, that their muscle balance was normal or was restored to normal with simple treatment.

In answer to the second question, as to what proportion of ocular disturbances could have been relieved by greater accuracy in refractive measurements without the aid of size lenses, the corrected vision of the patients was excellent as a rule, and the refractive measurements were usually accepted; but the ocular muscle balance was frequently inadequate, and a satisfactory examination for aniseikonia was not possible until binocular fusion was improved and until it could be maintained. With improvement in the maintenance of binocular fusion, several of the patients were as comfortable without the glasses as with them. (7 tables, references.) R. W. Danielson.

Eggers, Harry. Retinoscopy at a varying distance. Amer. Jour. Ophth., 1945, v. 28, March, pp. 318-319.

Fink, W. H., Trial frame for young children. Amer. Jour. Ophth., 1945, v. 28, April, pp. 403-404. (One figure.)

Gallego Fernández, Antonio. Functional significance of the visual cells. Arch. de la Soc. Oft. Hisp-Amér., 1944, v. 4, March-April, pp. 165-175.

The perception of light with its two components, chromatic and achromatic, is a function of the photoreceptor sys-

tems or functional unities of rods and cones in relation to the neighboring elements. The different proportions in which the rods and cones are found in the various zones of the retina explain the qualitative difference between central and peripheral vision. The visual acuity is also related to the distribution of the ganglion cells. (5 figures, references.) J. Wesley McKinney.

Hardy, L. H., and Rand, G. Elementary illumination for the ophthalmologist. *Arch. of Ophth.*, 1945, v. 33, Jan., pp. 1-8.

The optimum number of foot candles of illumination for gross and critical work has been a subject of heated debate. The effect of changes of illumination on ocular fatigue in the zones ordinarily encountered, that is, between 10 and 30 foot candles, is relatively unimportant. But continued use of the eyes, especially for fine work, under greatly inadequate or greatly excessive intensities will result in eyestrain and functional inefficiency.

An important factor in evaluating or prescribing lighting is the contrast involved in the work being done. High contrast means increased visibility. Contrast is frequently evaluated as percent and fitted into lighting prescriptions on that basis. For example, printer's ink reflects little (approximately 4 percent) of the light incident to it, while good white paper reflects about 80 percent of the light incident to it. The relative contrast of such ink and paper, then, is 80 percent less 4 percent, or  $76/80$ , which corresponds to 95 percent.

Glare is a factor in faulty distribution and has been defined as useless light in the field of vision. Its importance increases as it approaches a position on the line of sight. Glare may be

diffuse, specular, or direct. Diffuse glare is the type experienced outdoors from too high intensities. Specular glare is the type produced by mirrors, highly polished metal and furniture, glossy paper, and other shiny surfaces. Direct glare arises from bright objects in the field of vision, such as headlights out of doors or unshaded lamps indoors. Unpleasant effects of such sources of glare are, as already stated, directly proportional to the brilliance of the object and its proximity to the line of sight. Hence large sources of low intrinsic brilliance, achieved through "luminaire" design, diffusing glasses, or semi-indirect lighting, are according to the authors distinctly preferable to small, bright sources.

Fluorescent-tube lighting, introduced in 1938, has been growing in use and importance. But much is still to be desired, and it is too early to give an unqualified opinion. The present fluorescent tubes are too bright for comfort when unshielded, and most installations carry little or no shield. They do not, and probably cannot, be made to give the spectral curve of daylight. Fluorescent tubes are best suited for installations in large areas and are particularly useful in air-conditioned interiors because of their relatively low heat output. They should always be mounted high.

At the Knapp Memorial Laboratories, where studies on fluorescent lighting have been carried out, the authors have been inclined to explain the unpleasant effects of this type of lighting in terms of six factors: (1) flicker, either (a) total or (b) electrode; (2) spectral quality; (3) high intrinsic brightness; (4) radiation of wavelength of 312 to 313 millimicrons; (5) lag of emission in the blue-green-yellow por-

tion of the spectrum, and (6) stroboscopic effect. (2 figures, references.)

R. W. Danielson.

Harman, N. B. **Sight-saving classes.** Brit. Med. Jour., 1945, Jan. 13, p. 53.

The author commends the work of American educationists in the establishment of sight-saving classes, and relates his own early experiences in saving the sight of schoolchildren. He also discusses the progress and spread of such classes in England. The "potentialities of the school for the partially blind" lie in its ability to teach these children, mostly high myopes, to use their eyes intelligently.

Francis M. Crage.

Hecht, Selig. **Energy and vision.** Amer. Scientist, 1944, v. 32, July, p. 159.

An understanding of the amount of energy needed to see light requires a knowledge of physics, chemistry, some biology, and mathematics. After evaluating previous measurements of minimum energy necessary for vision and discussing optimum physiologic conditions, the author and his co-workers describe the technique of their measurements and offer tabulated results. The article, though rather technical, has interesting details on the physiology of vision. Frances M. Crage.

Knapp, A. A. **Eyeglasses for combat.** U. S. Naval Med. Bull., 1944, v. 43, Nov., p. 964.

The author criticizes the common belief of many that the serviceman with 20/20 vision should have no use for glasses in combat. He points out that many men are able to pass the 20/20 requirement but still request glasses for comparatively poor (20/20 or less) vision or for symptoms of

asthenopia. A large percentage of ametropic service men read the 20/15 line, and a fair number read even the 20/10 line. Vision is so important in combat and a man ought to have every possible advantage over his opponent. If by wearing glasses this can be obtained the practice is justified. Likewise, if asthenopic symptoms can be avoided by proper glasses a man is more efficient visually for prolonged watch or observation periods.

Glasses are not suited for use in situations where reflection may be a factor, such as night patrols, or hand-to-hand combat. The objection based on danger to the eyes from broken spectacle glass is answered by the argument that in present warfare injuries capable of breaking spectacle glasses usually are such that like damage could be expected to the unaided eye and orbit. Glasses are contraindicated in conditions such as spray aboard ship, or in the tropics where perspiration and fogging are common. Owen C. Dickson.

Posner, Adolph. **A contribution to the theory of binocular vision supported by three cases of latent nystagmus.** Amer. Jour. Ophth., 1945, v. 28, April, pp. 392-396. (References.)

Regan, J. J. **The goal of an eye-hygiene program for school children.** New England Jour. Med., 1944, v. 231, Oct. 5, pp. 486-490.

The cornerstone of a workable and effective eye-hygiene program rests on the understanding, especially among teachers and pupils, of the value of normal vision to the progress of health and education. The State Department of Public Health and the Department of Education should stimulate surveys by the school authorities in cities and towns and create interest in the ad-

vantages of requiring annual vision tests, with an authoritative statement regarding the importance of conducting the tests properly. An outline for teachers might be arranged, giving symptoms of eyestrain that may warrant a medical eye examination. Often a child with 20/20 vision in each eye suffers from sties, crusted red lids, watery eyes, or headaches after close work. Many of these children are farsighted, and if their accommodation is good the Snellen test will not screen them out. Such children often require glasses. A suitable committee could encourage inclusion of some simple color-perception test, especially for junior-high-school pupils who might be planning careers in art, aviation, or textile industry. Before any of these plans are undertaken it is important to record the presence or absence of normal vision in every school child. (References.)

M. Lombardo.

Sloane, A. E. Refraction clinic. *Amer. Jour. Ophth.*, 1945, v. 28, April, pp. 404-405.

Stiles, W. S. Photometer for measuring the scotopic candlepowers of self-luminous ophthalmic test objects. *Brit. Jour. Ophth.*, 1944, v. 28, Dec., pp. 629-637.

A photometer is described in which the scotopic candle-powers of very feeble light sources (down to  $10^{-9}$  candle) can be measured. The test consists of a comparison of the candle powers of the test object and of a standard source of the same size, by a substitution method. Small spots of radium paint 2 or 3 mm. in diameter are used to plot the dark-adapted visual field and the photometer described was designed for their calibration. (2 figures, 2 tables.)

Edna M. Reynolds.

Swan, K. C., and White, N. G. Dibutoline sulfate. (A new mydriatic and cycloplegic drug.) *Arch. of Ophth.*, 1945, v. 33, Jan., pp. 16-22; also *Trans. Sec. on Ophth., Amer. Med. Assoc.*, 1944, 94th mtg.

New mydriatic and cycloplegic drugs are needed. Recently the authors have synthesized the first substitutes for the atropine series effective on the eye. The new mydriatic and cycloplegic drugs are surface-active carbamic-acid esters of the choline type, and are therefore chemically unrelated to atropine. The ocular effects of the first of the new class of drugs have been reported previously. Herein are described the ocular pharmacologic effects and some clinical applications of dibutoline, the name chosen for the latest and most effective member of the series.

Dibutoline produces paresis of smooth muscles innervated by the parasympathetic nervous system. Its effects on the smooth muscles of the eye, therefore, simulate those of paralysis of the oculomotor nerve; that is, dibutoline produces paresis of the sphincter of the iris and the ciliary muscles. The action of dibutoline on the intraocular muscles is antagonistic to that of pilocarpine, physostigmine, acetylcholine and carbaminoylcholine.

Dibutoline has no effect on the ocular muscles innervated by the sympathetic nervous system, that is, the smooth muscle of the lid and the dilator fibers of the iris. It does not produce widening of the palpebral fissure, which is effected by epinephrine, cocaine, and related compounds; neither does it significantly alter reactivity of the dilator fibers of the iris to electrical stimulation of the cervical sympathetic nerve or to stimulatory drugs. Mydriasis produced by the new drug, therefore, may be enhanced by administration of

epinephrine or related compounds, which act by stimulating the dilator fibers.

As a substitute for the atropine series of drugs in routine cycloplegic refraction and in internal examination of the eye, dibutoline has several advantages, notably, rapid action, a short period of visual disability, and negligible systemic effects from ocular administration. Unlike the atropine series, the new drug has equal effect on the iris and ciliary body; consequently, the size and reaction of the pupil provide a convenient indication of the degree of cycloplegia. Dibutoline has an antiseptic action which may prove advantageous in the treatment of inflammatory conditions of the anterior segment. Its duration of action is ideal for treatment of such processes; it also facilitates penetration of other drugs. It has the disadvantage that repeated instillations produce irritation of the conjunctiva and a mild, transitory, superficial punctate disturbance of the corneal epithelium. These effects are due to the surface activity of the drug. (4 figures, references.)

R. W. Danielson.

#### 4

#### OCULAR MOVEMENTS

Burian, H. M. Motility clinic. Sudden onset of concomitant convergent strabismus. *Amer. Jour. Ophth.*, 1945, v. 28, April, pp. 407-410.

Davis, W. T. Paresis of right superior oblique and of left superior rectus muscle. *Arch. of Ophth.*, 1944, v. 32, Nov., pp. 372-380.

Paresis of the right superior oblique muscle differs in its manifestations, the symptoms depending on whether the paresis is of recent or of late origin.

Also, in the intermediate stage, when the paresis is recovering and the contractures are becoming manifest, the symptoms differ somewhat from those in the early and late stages. The most striking sign of this condition is habitual torticollis. It is present only when an oblique muscle is involved, either the superior or the inferior; it does not occur when the superior or the inferior rectus muscle is paretic. The two symptoms, torticollis and upshoot of the eye with the head tilt toward one shoulder, constitute the distinguishing feature. The torticollis is invoked by the patient to prevent diplopia.

It is interesting to note why the deviation due to paresis of the vertically acting muscle does not become noncomitant, as with paresis of the abducens nerve, for example. The influence of vertically acting muscles varies according to the position of the eyes. When the eye is abducted, it is within the field of the vertically acting rectus muscles; when the eye is adducted, it is within the field of the oblique muscles. It is apparent that the deviation due to paresis of a vertically acting muscle cannot become concomitant in the ordinary sense, since the deviation occurs only in the field of action of the oblique or the vertical rectus muscle. Consequently, it can be concomitant in these fields only.

Therapy is surgical; orthoptic training is indicated when the deformity has been surgically corrected. The first essential is a correct diagnosis; otherwise, irreparable harm may be done. With dissociated hyperphoria any surgical procedure is particularly to be avoided; in some cases this form may closely resemble the hypertropia of paresis of the superior oblique muscle,

treatment of which is purely surgical. To confuse the diagnosis of these two forms of hypertropia may be fatal to the desirable result—binocular single vision. The usual operation is myectomy of the right inferior oblique muscle.

Early, and late stages of this entity are presented in detail. (One reference, 9 figures.) R. W. Danielson.

Foster, John. Buried silk, catgut, and strabismus sutures. *Brit. Jour. Ophth.*, 1944, v. 28, Dec., pp. 625-629.

Clinical and experimental findings on the relative strength of buried catgut and silk strabismus-sutures are reported. The minimum safe tensile strength for a suture at the time of insertion is found to be about 30 ounces. Number 2 white braided silk and 000 catgut are probably initially unnecessarily strong, and number 0 white twisted silk is not reliable enough for deep strabismus suturing. Cotton thread is stronger than ophthalmic silk of the same diameter.

The length of sterilization up to six minutes has little effect on silk but silk sterilized in 2-percent sodium bicarbonate solution is only 97.7 percent as strong as when sterilized in distilled water. (3 tables, one comparing findings of various authors; references.)

Edna M. Reynolds.

Kaye, Herbert. The treatment of squint in childhood. *South African Med. Jour.*, 1944, v. 18, Oct. 14, p. 327.

The essence of the author's conclusions after experience in the treatment of this condition is the importance of time. The earlier any procedure is begun the greater the number of successes that may be expected. Early prolonged occlusion of the good eye in

the monocular types is used. The period of occlusion should be for not less than a month.

The largest group seeking advice are those patients between the ages of four and eight years. Those with small squint angles responded to stereoscopic exercise. The large-angle cases showed that effort on the stereoscope was wasted. Such cases called for very early surgery. The operative procedure usually followed was advancement of one muscle and recession of the opposing muscle. Absorbable scleral sutures were employed.

When a trial of glasses for six months, continuous occlusion, and stereoscopic exercises have failed to improve large or alternating squints, early operation is strongly recommended. After the surgical procedure, stereoscopic exercises are resumed.

Francis M. Crage.

Posner, Adolph. A contribution to the theory of binocular vision supported by three cases of latent nystagmus. *Amer. Jour. Ophth.*, 1945, v. 28, April, pp. 392-396.

Quereau, J. V., and Putnam, O. A. Quereau-Putnam tropophorometer. *Arch. of Ophth.*, 1945, v. 33, Jan., pp. 28-31.

The instrument here described has been designed to measure deviations of the eyes in cases of squint and heterophoria. It will measure vertical deviations in the six cardinal directions, as well as horizontal deviations for distance and near vision. Its accuracy, especially in objective tests, is greater than that of any other method of which the authors know. (3 figures.)

R. W. Danielson.

Reid, A. C. A simple method of dem-

onstrating nystagmus in certain miners. *Brit. Jour. Ophth.*, 1944, v. 28, Dec., pp. 598-599.

In order to demonstrate the cases of nystagmus which are present only in a stooping position, the author recommends the use of a concave mirror 12 cm. in diameter with a curvature of  $-0.75$  D. The patient stoops and fixes his gaze on this mirror in the dark. When he reports that the eye movements have begun, the examiner sees the oscillations (magnified) in the mirror with the aid of a pocket torch.

Edna M. Reynolds.

Smith, H. D., and Riesenman, F. R. Unusual forms of nystagmus. *Arch. of Ophth.*, 1945, v. 33, Jan., pp. 13-15.

The authors discuss several unusual and comparatively rare forms of nystagmus, and present a detailed case report. Two types of ocular nystagmus, volitional and occupational, and a form of mixed nystagmus due to compression of the upper cervical portion of the cord, are considered.

Persons with voluntary nystagmus have never had true nystagmus. The voluntary nystagmus of hysteria is jerky and irregular. With three exceptions, and excluding miners' nystagmus, a review of the literature of the past 25 years fails to reveal any case of occupational nystagmus. Occupational nystagmus results from interaction of several factors: poor and improper illumination, mechanical to-and-fro movement of the eyes incidental to the particular occupation, and retinal fatigue. (References.)

R. W. Danielson.

Sugar, H. S. An aid in using the prism cover test in the cardinal directions of gaze. *Amer. Jour. Ophth.*, 1945,

v. 28, April, pp. 397-398. (2 figures, references.)

## 5

### CONJUNCTIVA

Avtsin, A. P. Conjunctival exanthem in spotted typhus. *Arch. of Pathology*, 1943, v. 36, pp. 158-162.

The author calls attention to a gross sign which in its characteristic form justifies the suspicion of spotted typhus even in the absence of clinical data. The characteristics are multiple red spots and dots or points, and also oblong and oval spots, the latter being particularly characteristic. The sign is particularly useful in determining whether death has taken place from this disease. (5 photomicrographs, references.)

W. H. Crisp.

Beard, H. H., and Dimitry, T. J. Some observations upon the chemical nature of the pterygium. *Amer. Jour. Ophth.*, 1945, v. 28, March, pp. 303-305. (4 figures, references.)

Braley, A. E. Epidemic keratoconjunctivitis. *Arch. of Ophth.*, 1945, v. 33, Jan., pp. 47-55.

In 1889 Fuchs reported 38 cases of a disease he called "superficial punctate keratitis" which occurred in epidemic form in Vienna. The keratitis was preceded by acute conjunctivitis and the disease appears to have been similar to, if not identical with, the disease now under discussion.

A number of patients have undoubtedly contracted the disease in clinics.

Two incidents are related by the author: The first involved the use of the tonometer. In the diagnosis of epidemic keratoconjunctivitis, the intraocular tension was taken to rule out the

possibility of acute glaucoma. The tonometer was then used on two other patients with chronic glaucoma, in both of whom epidemic keratoconjunctivitis developed on the fifth and sixth days respectively after the examination. Adler called the other incident to the author's attention. In two patients who were given trial fittings of contact lenses, epidemic keratoconjunctivitis developed on the fourth and sixth days respectively after the fittings.

The author injected scrapings into white mice and was able to obtain a pathogenic virus.

The clinical disease may be divided into three stages. In stage 1, the primary symptoms are those of sensation of a foreign body, with moderate itching and burning. The most striking features are edema of the upper lid, and chemosis and edema of the semilunar fold and caruncle.

The disease enters the second stage in approximately 48 hours. Large follicles and considerable subconjunctival infiltration develop, particularly in the lower lid. The follicles in the conjunctiva are large, translucent, and usually oval. During this phase there is nearly always a palpable, slightly tender preauricular lymph node, and symptoms of involvement of the upper respiratory tract are often present. Frequently small hemorrhages are seen on both the bulbar and the palpebral conjunctiva, but they are not so severe as in acute pneumococcic conjunctivitis. A pseudomembrane may develop on either the upper or lower lid.

The third stage of the disease is characterized by persistence of the follicular conjunctivitis and by development of corneal changes, which produce symptoms of photophobia and blurring of vision. Corneal opacities usually begin to form on the seventh or eighth

day, typically beginning as minute, discrete subepithelial dots, occasionally so numerous that they coalesce to form a gray opacity in the superficial layers of the cornea. In spite of their numbers and their proximity, it is almost always possible with the biomicroscope to see that they are composed of discrete nebulas and that they do not all lie in the same level of the cornea.

Patients recovering from the disease have immune bodies for the virus in their serums. The sulfonamide compounds, penicillin, and probably tyrothricin have no effect on the virus. Convalescent plasma or serum, administered before the fifth day of the disease, is the treatment of choice. Corneal opacities developed in 99 percent of the patients treated symptomatically, but in only 30 percent of patients treated with convalescent plasma. (7 tables, 4 figures, including one color plate, references.)

R. W. Danielson.

Gartner, Samuel. Blood vessels of the conjunctiva. *Arch. of Ophth.*, 1944, v. 32, Dec., pp. 464-476.

The author used a new technique of high speed photography to study the blood vessels of the conjunctiva. A new light source producing flashes of approximately one-fifteen thousandth of a second with an intensity of about two million international candles is employed. This light source makes it possible to obtain photographs with great depth of field and quite free from the blur produced by motion. Magnifications of 35 diameters were used in the present study.

The diagnostic value of limbal capillaries in ariboflavinosis is questioned. In order to be sure as to formation of new vessels from this condition tests should be made after the instillation of histamine. It is only after the use of



histamine that all of the existing capillaries are filled sufficiently to be observed. The aqueous veins may be easily studied in the photographs. Layering of blood and aqueous in some of the channels makes them easily recognized. These vessels may be of particular importance in the study of glaucoma. The effect of physostigmine, pilocarpine, and epinephrine on the capillaries is described. The results of a few studies indicate that the conjunctival blood vessels react to histamine in a normal person in a manner similar to the reaction to allergins in an allergic patient. (11 illustrations, references.)

John C. Long.

Gurley, L. M., Jr. Pterygium transplantation by simplified method. U. S. Naval Med. Bull., 1944, v. 43, Dec., p. 1114.

The author describes a blunt dissection method consisting of the passage of a muscle hook beneath the neck of a pterygium and then by a combination of teasing and rocking motion slowly carrying the hook to the head of the pterygium until the growth is cleanly torn away from its corneal attachment. A conjunctival forceps fixed to the body of the pterygium serves for stabilization. No pericorneal conjunctival incision is made. Instead, using the conjunctival opening at the lower margin of the pterygium, the conjunctiva is undermined to the midline by tenotomy scissors. The head of the pterygium is then buried beneath this covering by means of a fine doubly-armed silk suture. Occasionally an exposed area may persist between the superior conjunctival lip and the superior edge of the now transplanted pterygium, but this can be obliterated with one interrupted suture. (4 drawings.)

Owen C. Dickson,

Leech, V. M. Chronic conjunctivitis caused by cystoid degeneration of the upper canaliculus. Amer. Jour. Ophth., 1945, v. 28, April, pp. 400-403. (One figure, one reference.)

Loewenstein, Arnold. The dionin effect in the conjunctiva. Brit. Jour. Ophth., 1944, v. 28, Dec., pp. 622-625.

Examination of subconjunctival hemorrhages with the slitlamp showed the presence of perivascular lymph channels four or five days after the occurrence of the hemorrhage, when the blood was undergoing absorption. After instillation of 2 to 5 percent dionin into the conjunctival sac, the lymph sheaths were found to disappear with the onset of edema, and to reappear after the edema had subsided. (2 figures, references.)

Edna M. Reynolds.

Loewenstein, Arnold. Trachoma virus and inclusion bodies. Amer. Jour. Ophth., 1945, v. 28, March, pp. 282-287. (2 black and white plates, 2 figures, references.)

Patwardhan, D. G. A case of plasmoma or plasmocytoma of the conjunctiva. Indian Jour. Ophth., 1944, v. 5, April, p. 46.

A girl aged 15 years complained of heaviness and thickness of the right upper eyelid, of six months duration. The eyelids opened only about halfway. On eversion of the eyelid, a flattened cauliflower-like growth was seen on the surface of the palpebral conjunctiva. It bled slightly. There was no trace of pannus. There was a history of a meibomian cyst having burst spontaneously. The growth was excised with the tarsal plate. The nodule had papillary projections and a well-formed fibrous capsule. It was traversed by a number of well-formed bloodvessels.

Microscopic study showed typical plasmoma cells. W. H. Crisp.

Rodin, F. H. Bacteriologic study of human conjunctival flora. *Amer. Jour. Ophth.*, 1945, v. 28, March, pp. 306-314. (5 tables, references.)

Rosenblum, H. H. So-called Reiter's disease; the triad of acute arthritis, conjunctivitis, and urethritis. *U. S. Naval Med. Bull.*, 1945, v. 44, Feb., p. 375.

This disease is a triad of acute arthritis, conjunctivitis, and urethritis. Having seen ten cases the author doubts that the condition is a rare one. The conjunctivitis is described as acute but of moderate degree although with purulent discharge. Serologic and bacteriologic studies were all negative. Sulfathiazole, sulfadiazine, sodium salicylate, and colchicine failed to help.

F. M. Crage.

Seelig, C. A. Gonorrheal ophthalmia; treatment with intraocular penicillin. *U. S. Naval Bull.*, 1945, v. 44, Feb., p. 389.

The author reports a case of gonorrheal ophthalmia with kerato-iritis and two large peripheral serpiginous corneal ulcers in a man aged 35 years. The smears were positive. Sulfathiazole, penicillin intramuscularly, iodine locally to the ulcers, and triple typhoid-vaccine injections did not help.

Subconjunctival injections of penicillin, corneal baths of penicillin, and trichloroacetic acid applied locally to the ulcers brought a cure in 29 days. The resultant vision was 20/20. Subconjunctival injections of 0.25 c.c. containing 1,250 units of penicillin were used every four days.

F. M. Crage.

Sorsby, A., and Hoffa, E. Local

penicillin for ophthalmia neonatorum. *Brit. Med. Jour.*, 1945, Jan. 27, p. 114.

A report is given of 47 cases of ophthalmia neonatorum treated by local application of penicillin in the form of drops. Concentrations of 500, 1,000, 1,500, and 2,500 Oxford units per c.c. were used. The cases were divided into four series. The cases treated with the 2,500-unit concentration, 22 in number, gave 21 cures, the largest proportion of satisfactory results of the four series. Penicillin seemed to be equally effective against all the common causal organisms of the disease. Diphtheroids and inclusion-body organisms seemed to be most resistant. After initial irrigation with half-normal saline at body temperature, one drop of penicillin is instilled. It is repeated half-hourly for the first three hours, then hourly for 24 hours, and every two hours thereafter. It is continued for 48 hours after clinical cure, at two-hour intervals during the day and three-hour intervals at night. Preinstillation irrigation is practised as long as discharge is present. Except for occasional mild transient injection of the conjunctiva, the drug is well tolerated by these eyes. In some instances recovery was a matter of a few hours. On the whole the results are considered to be parallel with those obtained from the sulfonamides.

F. M. Crage.

Town, A. E. Gonorrheal ophthalmia treated with penicillin. *U. S. Naval Bull.*, 1945, v. 44, Feb., p. 387.

A marked case of gonorrheal ophthalmia in a male aged 22 years was treated with penicillin injections intramuscularly. There were no more gram-negative diplococci 48 hours after therapy was started. The only local treatment used was atropine, because there were no complications.

F. M. Crage.

## 6

## CORNEA AND SCLERA

Bellows, J. G. Krukenberg spindle and its relation to annular pigmented band on periphery of the lens. *Arch. of Ophth.*, 1944, v. 32, Dec., pp. 480-482.

The mechanism for formation of the pigment band known as the Krukenberg spindle is not clearly understood. The corneal pigment is derived either from degenerative changes in the iris or, if the spindle is associated with a pigment ring on the periphery of the lens, from the pigment markings on the surface of the lens. It is likely that alterations in the corneal endothelium must take place before the fine pigment granules can adhere to the cornea. The greater frequency of the Krukenberg spindle in females, particularly women past the menopause, supports the theory that endocrine dysfunction plays a part in its formation.

Within less than a week the author observed this rare pigment abnormality in two young persons in an Army hospital. The first patient was a seaman aged 28 years who appeared for a routine ocular examination. A fusiform streak composed of fine brown particles was observed on the posterior surface of the right cornea. The left eye showed no corneal streak but did show pigment particles near the pupillary border of the iris. Two weeks later a typical Krukenberg spindle appeared in the left eye. The second case was encountered in a nurse aged 21 years. Bilateral Krukenberg spindles were observed associated with a dense brown pigmented ring visible around the entire circumference of the lens, almost coinciding with the margin of the completely dilated pupil. It is thought that the pigmented markings of the lens result from abnormal maintenance of contact

between the tips of the ciliary processes and the lens in early life. (2 illustrations, references.) John C. Long.

Bilger, Izzet. Local application of vitamin A to the eye. *Göz Klinigi*, 1944, v. 1, no. 6, p. 219.

Good results are reported from local application of vitamin-A drops (Vogan) in several cases of superficial corneal disease. Joseph Igersheimer.

Braley, A. E. Epidemic keratoconjunctivitis. *Arch. of Ophth.*, 1945, v. 33, Jan., pp. 47-55. (See Section 5, Conjunctiva.)

Caire, Lincoln. Considerations regarding case of keratoconus. *Rev. Brasileira de Oft.*, 1944, v. 3, Dec., pp. 65-72.

The patient, whose age is not given, had vision of less than 1/20 for the right eye and 1/10 for the left eye, without correction. The right eye obtained vision of 8/10 with minus 17.50 cylinder axis 70 degrees, and the left eye vision of 1.0 with minus 5.25 cylinder axis 95 degrees combined with 4 D. sphere. These lenses were completely tolerated and were therefore prescribed. The patient was subjected to intravenous and intramuscular injections of a form of antimony, and after two months showed no modification in axis or strength of correction, or in visual acuity. (References.)

W. H. Crisp.

Pullinger, B. D., and Mann, I. Avascular healing in the cornea. *Jour. Path. and Bact.*, 1943, v. 55, pp. 151-158. (See Section 16, Injuries.)

## 7

## UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Bellows, J. G. Pigmented lines in retroiridal region of anterior capsule

of lens. *Arch. of Ophth.*, 1944, v. 32, Dec., pp. 483-484.

Radial pigmented lines have been observed to occur on the anterior surface of the lens. These lines can be seen only with the slitlamp and usually require mydriasis. The lines are delicate and radially directed, and if present in all sectors they form a wreath. The striae are variable in size. The total number of lines ranges from less than ten to several hundred. In some sections they lie close together, whereas in others they may be represented by only a solitary line. According to Vogt's hypothesis these lines are a vestige of the capsulopupillary membrane. Streiff and Bischler state that the lines are remnants of the pupillary membrane which at first are nonpigmented but which may become pigmented in elderly persons as a result of disintegration and freeing of the pigment of the iris.

The author reports two cases of this condition. The first patient, a man of 57 years, showed delicate brown radial streaks, forming a wreath, on the anterior capsule of each lens. The other patient, a soldier aged 27 years, showed the same anomaly. This is the first time that pigmented lines have been reported in a subject under the age of 40 years. (One illustration, 2 tables, references.)

John C. Long.

## 8

### GLAUCOMA AND OCULAR TENSION

Allen, T. D. Congenital glaucoma and cataract, bilateral; goniotomy and needling. *Amer. Jour. Ophth.*, 1945, v. 28, April, pp. 388-392.

## 9

### CRYSTALLINE LENS

Allen, T. D. Congenital glaucoma and cataract, bilateral; goniotomy and

needling. *Amer. Jour. Ophth.*, 1945, v. 28, April, pp. 388-392.

Bellows, J. G. Krukenberg spindle and its relation to annular pigmented band on periphery of the lens. *Arch. of Ophth.*, 1944, v. 32, Dec., pp. 480-482. (See Section 6, Cornea and sclera.)

Bellows, J. G. The crystalline lens in diabetes mellitus. *Arch. of Ophth.*, 1944, v. 32, Dec., pp. 498-507.

This article is a detailed review of the lens changes in diabetes. Since most of the visual disturbances in diabetic patients occur after the age of 40 years, it is difficult to differentiate between merely senile changes and changes actually due to diabetes. Nevertheless, there appears to be a significant relation between the incidence of ocular disease and diabetes. Well over half of the diabetic visual disturbances are due to changes in the lens and retina. Two types of abnormality of the lens appear: (1) transitory refractive changes and (2) diabetic cataract.

The transitory refractive changes may give rise to either myopia or hypermetropia. Such myopia occurs only in cases of fresh diabetes with a high level of blood sugar and is less common and of lesser degree than diabetic hyperopia. The hyperopia always follows the myopia before a return to the normal refractive state. Hyperopia, on the other hand, may arise without preceding myopia. Hyperopia appears only when the patient's general condition begins to improve, and regression to the normal state is gradual, generally requiring two to four weeks. Weakness of accommodation accompanies hyperopia in persons under thirty years of age. The author discusses the numerous anatomic and physiochemical theories advanced to explain the refractive changes.

Statistics on diabetic cataract are extremely difficult to interpret, as the values are vitiated by the frequency with which the term has been used to apply to any cataract in a diabetic person. More accurately, it should refer to the characteristic cataract found in young persons with diabetes. In older diabetics the cataract becomes indistinguishable from senile cataract. Some observers state that diabetes may aggravate or hasten opacification of the lens initiated by senility. Since the effects of diabetes are in many respects similar to those of age, a diabetic person might be expected to show signs of senility which otherwise would not appear for many years.

Various theories are given to explain the pathogenesis of diabetic cataract. It is characterized by the appearance, under the capsule of each lens, of fluid vacuoles which progress to complete opacity in periods of a few weeks to six months. Goulden (see *Amer. Jour. Ophth.*, 1930, v. 13, p. 78) pointed out that the typical subcapsular opacities invade the space between the capsule and the band of disjunction, whereas in all other forms of cataract this space remains clear.

Control of the diabetic condition seems in many cases to be beneficial as to diabetic cataracts. Vigorous insulin treatment may delay or arrest the process in the lens, or may even in rare cases cause regression of recent diabetic opacities. Insulin has been of great value in preoperative preparation for removal of cataracts in diabetics. Before the use of insulin, the operation for such cataracts was attended by very serious dangers from infection and hemorrhage. (Bibliography.)

John C. Long.

Dunnington, J. H. Some complica-

tions of cataract extraction. *New York State Jour. Med.*, 1944, v. 44, Oct. 15, p. 2224.

Hemorrhage into the anterior chamber usually occurs from the wound rather than from the iris. Unless very severe, it clears without producing any serious effect upon the ultimate visual result. The proper treatment consists of complete bed rest and thorough atropinization. Hot compresses frequently do more harm than good. Iris prolapse results from faulty reposition of the iris, defective wound closure, or subsequent wound rupture. Corneoscleral sutures do much to prevent its occurrence. Prompt excision of all prolapses is advised, with the possible exception of small ones adequately covered by conjunctiva. Delayed restoration of the anterior chamber usually means either faulty wound closure or the presence of a filtering cicatrix. Proper toilet of the wound and adequate sutures are the best prophylactic measures. Prompt repair of all leaking wounds will lessen the incidence of epithelization of the anterior chamber and postoperative glaucoma. Theodore M. Shapira.

Ramón Roda, J. Detachment of the retina in aphakic eyes. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, March-April, pp. 199-204. (See Section 10, Retina and vitreous.)

## 10

### RETINA AND VITREOUS

Arruga, H. When to operate in detachment of the retina. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, March-April, pp. 205-208.

During the period of bed rest prior to operation for retinal detachment the case may follow any of three courses. In the first, the retina settles down in

the region of the tear. As soon as this condition has been obtained the operation should be done. In the second group, the detachment remains unchanged with rest in bed. This is seen most usually with the disinsertions, wherein nothing is to be gained by waiting for reapplication of the retina. The same is true in the case of small tears with an altered choroid which does not readily absorb the subretinal fluid. If there is a very large tear, the choroid may not be able to absorb the large amount of fluid which passes through the tear. Here, by emptying the subretinal fluid, an initial operation may save the macular vision and make more favorable a second operation. In the third group of cases, the detachment becomes worse despite bed rest. This probably indicates a choroiditis, in which event the operation should be postponed.

J. Wesley McKinney.

Ballantyne, A. J., and Loewenstein, A. **Retinal micro-aneurysms and punctate hemorrhages.** *Brit. Jour. Ophth.*, 1944, v. 28, Dec., pp. 593-598.

Many, if not most, of the so-called deep punctate hemorrhages characteristically seen in diabetic retinopathy are shown to be capillary aneurysms, mostly in the inner nuclear layer, in the course of the capillaries which link the deeper and the more superficial capillary plexuses of the retina. The aneurysms show a remarkable uniformity in size and have the appearance of globular collections of red blood cells enclosed in walls of varying thickness. They may be a source of hemorrhage, but many of them are seen to undergo a process of thrombosis and cicatrization. They represent a stage in the vicious circle in which changes in the capillary endothelium lead to stasis in

the circulation, which in turn causes further vascular changes, especially on the venous side. (12 illustrations, references.)

Edna M. Reynolds.

López Enriquez, M. **Ophthalmoscopic examination during operation for retinal detachment.** *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, March-April, pp. 224-226.

Stressing the importance of ophthalmoscopic control during the operation for retinal detachment, the author advises a minimum instillation of local anesthetic preoperatively, dispensing with the use of adrenalin and instillations of saline, and, most important, keeping the cornea covered with the lid by not using a speculum.

J. Wesley McKinney.

Macgregor, I. S. **Bilateral partial ectasia of the nerve head with peripapillary ectasia.** *Brit. Jour. Ophth.*, 1944, v. 28, Dec., pp. 618-622.

A case of partial bilateral excavation of the disc below, with complete wide scleral halo and gross pigmentary disturbance in a child aged seven years, is reported. The margins of the discs were best seen with  $-6.00$  diopters and the floor of each cup with  $-18.00$  diopters. The central fundus and the periphery were best seen with no correcting lens in the ophthalmoscope. No macular reflex could be seen in either eye. The fields showed a definite wedge defect in each eye. The tension was normal. The anterior segments of the eyes were normal. The Wassermann was negative and the mother's eyes were normal. The case is reported because it differs from other similar cases reported in the literature in that the discs were not completely excavated. (4 figures, references.)

Edna M. Reynolds.

Poyales. Vitreous hemorrhage in the surgical treatment of retinal detachment. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, March-April, pp. 219-223.

Hemorrhages may be immediate or delayed, occurring several days after operation. The best treatment is prophylaxis. A thorough study for blood dyscrasia is carried out before the operation and if the slightest abnormality is found coagulant drugs are given. At operation it is important to avoid the venae vorticosae and not to use too strong a current. If hemorrhage occurs immediately, surface diathermy should be used in the surrounding area to cause thrombosis of the vessels. After three weeks short-wave diathermy may be used to promote absorption of the blood.

J. Wesley McKinney.

Prior Guillem, Antonio. New separator for the operation of retinal detachment. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, March-April, pp. 209-210.

An instrument is described for separating the tissues about the globe to increase the field of view during the operation.

J. Wesley McKinney.

Ramón Roda, J. Detachment of the retina in aphakic eyes. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, March-April, pp. 199-204.

The incidence of retinal detachment in aphakia as reported by various authors was noted to vary between 1 and 2.5 percent. The author speculates on the causes of detachment after uncomplicated cataract extraction. No definite conclusions are drawn. (One color plate, including 4 figures.)

J. Wesley McKinney.

Salgado Benavides, Enrique. A new case of von Hippel's disease. *Arch. de*

*la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, March-April, pp. 194-196.

A case is reported with colored drawings. No mention of treatment is made.

Salgado Benavides, Enrique. Three cases of Stargardt's disease. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, March-April, pp. 185-193.

Stargardt's disease is a familial retinal degeneration beginning at the macula and of unknown etiology.

The disease is progressive and may be divided into three phases. In the first phase, vision is reduced but no retinal lesion can be seen. In the second stage yellowish spots surrounded by pigment develop in the macular region. Finally large degenerative foci are seen throughout the retina. The process does not produce total blindness. Three cases are reported from a single family. (One color plate.)

J. Wesley McKinney.

Von Sallmann, L. Hydrogen-ion concentration of the vitreous in the living eye. *Arch. of Ophth.*, 1945, v. 33, Jan., pp. 32-39.

The concept of the relation of even small changes in hydrogen-ion concentration to vital biochemical and biophysical processes has stimulated many studies on acid-base equilibrium in various body fluids and tissues. The interest of ophthalmologists has been focused mainly on one phase of this relationship, that is, the changes in turbescence of colloids due to a shift in the hydrogen-ion concentration.

The author gives a technical description and discussion of his experiments on hydrogen-ion concentration in the living eye. A glass electrode of the thin-membrane type was designed for determination of the  $pH$  in circumscribed areas of the vitreous in vivo.

Accurate measurements of temperature in the examined area were obtained by use of a thermocouple. A range in pH of 7 to 7.10 was recorded for the normal vitreous of rabbits. There was a trend toward increase of hydrogen-ion concentration in the cortical layers of the vitreous. This shift may be the result of acid formation caused by high glycolytic activity of the retina.

Local acidosis, up to a pH of 5.7, developed in the early stages of an acute staphylococcic infection of the vitreous. The acidity decreased during the following weeks. Several months after the inflammation had been arrested by penicillin, a normal range of pH was restored in the vitreous, or the acidity was succeeded by a slight alkalosis. In eyes in which the retina had been partially destroyed by systemic treatment with sodium iodate, readings indicated higher alkalinity than for normal eyes. (One diagram, one table, references.) R. W. Danielson.

Theodore, F. H., and Bonser, W. H. Congenital arterial aneurysm at the papilla. *Arch. of Ophth.*, 1944, v. 32, Dec., pp. 492-495.

Considerable confusion exists in the classification of aneurysms of the retinal vessels. The cases previously reported may be classified as follows: (1) aneurysms of the larger branches of the central retinal artery, all of which appear to have been secondary to vascular disease or trauma, and which are generally associated with visual impairment; (2)iliary aneurysms, which are of two types, one essentially a senile degenerative phenomenon, the other neoplastic, and (3) arteriovenous aneurysms, essentially congenital in origin.

The author describes an aneurysm that does not correspond exactly to any

previously described. The patient was an aviation cadet of 19 years with 6/5 vision in each eye. The left optic disc was almost entirely obscured by a serpentine aneurysmal dilatation of the inferior temporal artery, which occupied the temporal seven eighths of the nerve head. The aneurysm consisted of sausage-like, saccular coils of artery, dilated to at least four times the normal diameter. These were connected by narrow, vermiform portions and contained blood. Moderately dense glial tissue covered all but the summits of the larger dilatations and extended beyond the margins of the aneurysm to obscure the margins of the disc. The aneurysm did not pulsate but carotid pressure caused it to collapse partially. Except for the region of the disc, there were no arterial abnormalities. (One illustration, references.)

John C. Long.

Yudkin, Simon. The effect of the duration of stimulus on threshold measurements in the dark-adapted eye. *Brit. Jour. Ophth.*, 1944, v. 28, Dec., pp. 611-617.

A series of experiments carried out on about 600 airmen at an R.A.F. station in England are reported. The dark-adapted rod thresholds of these men were measured on three occasions at intervals of three weeks. On each occasion the threshold of each man was measured, using two different periods of exposure. One of these was 0.2 second and the other 0.02, 0.04, 0.1, 0.5, or 1 second, the same two exposures being used for each man for all three tests. Thus all the men were tested with the 0.2-second exposures and from 60 to 115 men with each of the other exposures. During the intervals between tests, the men received various vitamin or dummy tablets. No specific effect



on the thresholds was produced by any of these supplements, so that the results for each exposure may be considered independently of any treatment given.

The mean threshold was found to be lower for the longer durations up to 0.5 second, but the lowering of the threshold was not proportional to the increased duration of exposure. The range of the thresholds for all the groups was the same whatever the exposure. The variability of individual thresholds from test to test was least with the 0.2-second exposure and more for all the other exposures. (One drawing; 3 tables, references.)

Edna M. Reynolds.

## 11

### OPTIC NERVE AND TOXIC AMBLYOPIAS

Carroll, F. D. **Visual symptoms caused by digitalis.** *Amer. Jour. Ophth.*, 1945, v. 28, April, pp. 373-376; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42. (One table, references.)

Hardy, Guerdan. **Maxillary sinusitis with optic neuritis.** *Amer. Jour. Surg.*, 1944, v. 66, Oct., p. 126.

A careful study of the paranasal sinuses is indicated when retrobulbar or optic neuritis occurs. In one case of maxillary sinusitis with optic neuritis, the author found that, whereas conservative treatment resulted in slight improvement in visual acuity, rapid betterment and ultimate normal vision followed the removal of infected tissue from the maxillary sinus. It is fair to conclude that the infection within the antrum was the cause of the optic neuritis. Conservative measures should be instituted while the search for foci of infection is progressing, but once a

focus is definitely established it must be eliminated without delay.

Theodore M. Shapira.

Kravkov, S. V., and Mursin, A. N. **Electrical sensitivity of the eye in some optic-nerve diseases resulting from cranio-cerebral traumata.** *Amer. Jour. Ophth.*, 1945, v. 28, April, pp. 363-369. (5 figures, one table, references.)

Moehle, Walter. **Complete congenital pigmentation of the optic disc.** *Amer. Jour. Ophth.*, 1945, v. 28, April, pp. 377-380. (References.)

## 12

### VISUAL TRACTS AND CENTERS

Hartmann, Edward. **Optochiasmic arachnoiditis.** *Arch. of Ophth.*, 1945, v. 33, Jan., pp. 68-77.

Hartmann's definition of optochiasmic arachnoiditis is a localized inflammatory process at the base of the brain, affecting the chiasm and the optic nerves, as well as the meninges which surround them. As to frequency, statistical data do not give a true picture, since the disease is not widely known and its existence as an entity is not universally accepted.

The lesions encountered may, rather artificially, be separated into three types: thickening and adhesions of the arachnoid, circumscribed collections of fluid, and atrophy of the optic nerves and chiasm. Any one of these three types rarely occurs alone but merely predominates, and the relative proportion is variable. Of a group of 129 cases, the total number in which possible causes were found was 81. The most frequent were infection of the nose and sinuses, trauma, and syphilis. The mechanisms of action are direct pressure, inflammatory processes, and impaired blood flow.

The diagnosis depends upon field defects, lowering of visual acuity, fundus changes, and other symptoms, combined with roentgenographic evidence. The field defects and fundus changes are quite varied. Contrary to what usually occurs in cases of pituitary adenoma, the visual acuity fails at an early stage of the disease. Roentgenologic studies show none of the signs usually found with sellar or suprasellar tumors. The sella is not enlarged, and air studies usually prove the ventricles to be of normal size and location.

If nonoperative treatment brings no improvement, especially if vision and fields continue to fail, surgical intervention should not be delayed too long. The chiasmic region can now be explored with but slight mortality. The visual results are far from being as favorable as those following removal of a tumor, but have been far better when operation was done in the early stages of the disease. (Bibliography.)

R. W. Danielson.

### 13

#### EYEBALL AND ORBIT

Abundio Álvarez. **Sulfonamides in the treatment of panophthalmitis.** Arch. de la Soc. Oft. Hisp.-Amer., 1944, v. 4, March-April, pp. 233-237.

A case of panophthalmitis is reported whose symptoms subsided rapidly under sulphonamide therapy. The final result was atrophy of the globe. (One photograph.) J. Wesley McKinney.

### 14

#### EYELIDS AND LACRIMAL APPARATUS

Brav, Aaron. **Accidental vaccinia of the eyelid with disciform keratitis.** Arch. of Ophth., 1945, v. 33, Jan., p. 67.

The author reports such a case in a 14-year-old girl. (One photograph.)

R. W. Danielson.

Gifford, Harold, Jr. **Dacryocystitis. The transplantation operation.** Arch. of Ophth., 1944, v. 32, Dec., pp. 485-487; also Trans. Sec. on Ophth., Amer. Med. Assoc., 1944, 94th mtg.

The etiologic factor in the infantile type of dacryostenosis is the failure of the lower end of the nasolacrimal duct to open soon after birth. If this end fails to open when lacrimation starts, the sac cannot empty and soon becomes infected. The mucous glands hypertrophy and a mucocele develops within a month or two. Out of 37 cases of the infantile type, in 19, or about one half, cure was effected without surgical intervention. The duct was probed in the other 18 cases, cure being effected in all but four. In all four cases in which probing failed to cure the stenosis, the probing had been done before the age of six months. The author believes that probing should never be done before the age of six months. When the lower end of the duct becomes patent, spontaneous cure will take place. Direct pressure on a full sac exerted down toward the canal will hasten this result. If probing becomes necessary it is done under light ether anesthesia, using only the smallest probe so that little damage is done to the lining of the lacrimal duct.

The etiology of the adult forms is not so simple. Trauma, infection of the sac, tumors, and nasal pathologic processes account for most of them. Acute dacryocystitis can be more effectively treated when the sulfonamide compounds and penicillin are used. An attempt is made to empty the sac by gentle pressure and lavage, but no probing is done beyond the canalicu-

lus. If this measure fails, the sac should be incised deeply and sulfanilamide powder dusted in or carried in with a drain.

An atrophic sac presents the problem of tearing only, since it rarely becomes reinfected and there is no danger to the cornea. In such cases the Arruga technique may be applied, or the secretory duct from the lacrimal gland may be excised safely if tearing is annoying.

In nearly 90 percent of the cases, mucocoele can be cured by dacryocystorhinostomy. The author uses a technique that has been elaborated by Burch, Speciale-Cirincione, and Stokes. The lower end of the sac is freed through an external approach; a trephine opening, 8 mm. in diameter, is made into the nose, and the open lower end of the sac is held in place in the nose by sutures pulled out on the cheek. Results of this operation in 85 cases are tabulated. (4 tables, references.)

John C. Long.

Gray, H. Trichomegaly or movie lashes. *Stanford Med. Bull.*, 1944, v. 2, Nov., p. 157.

The author describes a case of giant or elongated eyelashes in a male aged 64 years. The lashes measured 20 and 22 mm. long. The condition existed also in the patient's daughter, and this suggested heredity as a possible etiologic factor. The term trichomegaly is proposed for the condition. F. M. Cragg.

Hendricks, L. J. Operation on the punctum lacrimale. *Arch. of Ophth.*, 1944, v. 32, Dec., p. 496.

In most cases of dacryocystitis an operation on the lacrimal point with subsequent gentle probing of the lacrimal duct into the nose will make dacryocystectomy unnecessary. Slitting, with probing of the lacrimal duct,

helps in relief of congenital stenosis of the duct in infants, acute and chronic dacryocystitis, chronic catarrhal conjunctivitis, catarrhal ulcer of the cornea, senile spastic ectropion and entropion, and that annoying epiphora so often seen in older people. A probe slightly larger than a blunt-pointed darning needle is inserted into the sac through the inferior punctum. After the probe is passed into the sac, the canaliculus is slit with a probe-pointed knife, the actual incision being made slightly on the conjunctival side of the lid. Between one third and one half the distance between the punctum and the inner canthus is incised. The incision must be kept open until the edges are healed. At each visit the duct is probed all the way to the nose. Larger and larger probes are used, but there does not seem to be any necessity for using an instrument larger than a no. 5 or no. 6 Bowman probe. (References.)

John C. Long.

Leech, V. M. Chronic conjunctivitis caused by cystoid degeneration of the upper canaliculus. *Amer. Jour. Ophth.*, 1945, v. 28, April, pp. 400-403. (One figure, one reference.)

Simpson, G. V. Sulfadiazine in treatment of dacryocystitis of the newborn. *Arch. of Ophth.*, 1945, v. 33, Jan., pp. 62-66.

The treatment of simple epiphora, or of epiphora complicated by dacryocystitis, occurring soon after birth is based on the premise that an obstruction is present at some point along the nasolacrimal duct. The types of obstruction may well be considered as either anatomic or accidental. A résumé of the literature on the use of sulfonamides in dacryocystitis is given.

In this paper the emphasis is placed

on the element of infection and its cure. When a case of congenital epiphora with dacryocystitis is seen for the first time, it is impossible to know whether an anatomic obstruction exists, and for that reason chemotherapy in conjunction with other conservative treatment is to be recommended in all cases. It is probable that such treatment, especially if instituted early, will result in surgical treatments being required in fewer cases. The author reports two cases in which a satisfactory response was obtained by administration of sulfadiazine. (References.)

R. W. Danielson.

Spake, L. B. Chronic dacryocystitis. Treatment from the rhinologist's point of view. *Arch. of Ophth.*, 1944, v. 32, Dec., pp. 488-491; also *Trans. Sec. on Ophth.*, *Amer. Med. Assoc.*, 1944, 94th mtg.

Chronic dacryocystitis may be classified as follows: (1) infection of the sac with intranasal abnormalities; (2) infection of the sac with involvement of accessory nasal sinuses; (3) infection of the sac without intranasal involvement; (4) recurrent infections of the sac with or without a fistulous tract or stenosis of the duct.

Careful attention to the intranasal condition should be given before attempting an external surgical procedure. The technique of the Mosher-Toti operation is given in detail. With this method the author has had successful results in 80 percent of cases of chronic suppurative dacryocystitis. (References.)

John C. Long.

## 16

### INJURIES

Blake, P. M. Injuries to the eye or to the intracranial visual paths in air-

raid casualties admitted to hospital. *Brit. Jour. Ophth.*, 1945, v. 29, Jan., pp. 1-5.

This is a report on 764 cases admitted to the hospital on account of injuries in air raids. Eighty of this number died of their wounds. Of the remainder, 66 suffered either direct ocular injury or some intracranial injury which affected vision. Twenty-nine of these 66 had either complete or partial blindness. There were 14 cases of penetrating wounds, 3 of them bilateral. Ten patients suffered fractures of the skull or orbit which impaired vision.

Edna M. Reynolds.

Chandler, P. A. Recurrent erosion of the cornea. *Amer. Jour. Ophth.*, 1945, v. 28, April, pp. 355-363; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42. (Bibliography.)

Gallego Fernández, Antonio, *Histologic notes*. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, March-April, pp. 177-184.

In an eye enucleated on account of a perforating wound with loss of a large amount of vitreous, an anomalous position of many retinal cones in front of the external limiting membrane was found.

A case is reported of a hitherto undescribed retinal lesion resulting from improper use of X ray in treatment of carcinoma of the upper lid. The exact dosage of X ray given was not noted. The eye was enucleated on account of necrosis of the cornea with perforation. The retina was found to be infiltrated with round cells and a low detachment was present in the macular region. Deformation of Nissl bodies, vacuolization and picnosis of the nuclei of ganglion cells, and vacuolization of the

cones were the most notable lesions. (7 figures.) J. Wesley McKinney.

Oaks, L. W. Improved treatment for chemical burns of the eye. *Amer. Jour. Ophth.*, 1945, v. 28, April, pp. 370-373. (References.)

Pullinger, B. D., and Mann, I. Avascular healing in the cornea. *Jour. Path. and Bact.*, 1943, v. 55, pp. 151-158.

In an investigation of the clinical pathology of experimental lesions made with liquid dichlorodiethylsulphide (mustard gas) in the eyes of rabbits, it was found that spontaneous avascular healing invariably followed if the applications of the liquid droplets damaged the center of the cornea alone and left the corneoscleral junction uninjured and free from edema, the end result being either restoration of complete transparency or the formation of faint nebulae of varying degrees of opacity, without blood vessels. To determine the nature of the cells which invade the cornea, healthy rabbits with cornea free from signs of permanent damage were given intravenous injections of 5 c.c. of a 5-percent-solution of a dye (Pontamine sky blue 6 BX) before application of the liquid mustard gas to the cornea. The animals were killed at various stages of healing, and the corneas fixed and cut for microscopic examination. Injuries were also produced by certain other chemical agencies. In vitally dyed animals, invasion of the substantia propria, during healing, by wandering cells in numbers far greater than normal was observed. Some of the wandering cells acted as macrophages, others were transformed into keratoblasts and fibrocytes. A transformation of others into corneal corpuscles seemed probable. (2 plates,

including 13 photomicrographs, references.) W. H. Crisp.

Rodin, F. H. Chart for recording location of corneal injuries and lesions. *Amer. Jour. Ophth.*, 1945, v. 28, April, pp. 405-406. (2 charts, one reference.)

Scobee, R. G. Penicillin in the treatment of perforating ocular injuries and in uveitis. *Amer. Jour. Ophth.*, 1945, v. 28, April, pp. 380-387. (11 figures, references.)

Sertorio Senna, Extraction of non-magnetic intraocular foreign bodies under radioscopic examination, *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, March-April, pp. 227-232.

In two cases reported, bird shot was extracted from the vitreous by means of a forceps guided by fluoroscopy. (8 illustrations.)

J. Wesley McKinney.

Thorpe, H. E. A new corneal splinter forceps. *Arch. of Ophth.*, 1944, v. 32, Dec., p. 497; also *Trans. Sec. on Ophth.*, *Amer. Med. Assoc.*, 1944, 94th mtg.

A modification of a pair of fine watchmaker's tweezers has proved helpful in the removal of splinters of wood, thorn, or brass from the cornea. The sharply pointed tweezer blades have several parallel grooves filed on their opposing inner surfaces. These grooves slant backward, so that backward-pointing steel ridges give a vise-like hold on the object grasped. (4 drawings.)

John C. Long.

Thorpe, H. E. Shell for roentgenographic localization of intraocular foreign bodies. *Arch. of Ophth.*, 1944, v. 32, Dec., p. 497; also *Trans. Sec. on Ophth.*, *Amer. Med. Assoc.*, 1944, 94th mtg.

The author describes a modification of the Comberg contact lens for intra-ocular localization. The Comberg lens is sometimes displaced by the lid. To avoid this difficulty three small holes are drilled into the contact lens so that scleral sutures may be used to secure it in place. Sometimes suction develops between the shell and the eyeball, causing difficulty in removal. This is avoided by drilling a small vent hole. An additional improvement is constructing the shell of plastic instead of glass. (One illustration.)

John C. Long.

Wright, R. E., and Duncan, H. A. G. The giant magnet in ophthalmic battle casualties. *Brit. Med. Jour.*, 1944, Nov. 18, p. 658.

A minute magnetic foreign body imbedded in the retina "3 disc-diameters down and in from the disc," after passing through the eyeball, was removed by the giant magnet at a third session, the last being made 17 days after the first session. The authors stress especially the great importance of patience and perseverance of operator and patient in such cases. Beak-shaped terminals are preferred to the blunt type because the field of magnetic action is less diffuse with the former and delivery more accurate. Diathermy applications to a scleral wound should be made at the end of the operation, as reaction from such treatment complicates the technique if more than one sitting becomes necessary.

F. M. Crage.

## NEWS ITEMS

Edited by DR. DONALD J. LYLE  
904 Carew Tower, Cincinnati 2

News items should reach the editor by the twelfth of the month.

### DEATHS

Dr. Sigmund A. Agatston, New York, New York, died March 5, 1945, aged 68 years.

Dr. Howard S. Browne, Ponca City, Oklahoma, died January 27, 1945, aged 58 years.

Dr. Arthur H. Brownell, Oneonta, New York, died January 10, 1945, aged 80 years.

Dr. DeForest W. Buckmaster, Jamestown, New York, died February 3, 1945, aged 47 years.

Dr. Thomas W. Deachman, Chicago, Illinois, died March 25, 1945, aged 76 years.

Dr. Charles H. Evans, Danville, Illinois, died March 26, 1945, aged 69 years.

Dr. Alfred G. Farmer, Dayton, Ohio, died April 2, 1945, aged 67 years.

Dr. Michael L. Levitt, Philadelphia, Pennsylvania, died January 1, 1945, aged 65 years.

Dr. Lloyd C. Pierce, Harrisburg, Pennsylvania, died March 22, 1945, aged 48 years.

Dr. Joseph H. Potts, New Britain, Connecticut, died March 24, 1945, aged 65 years.

Dr. Charles J. Price, Mount Morris, Illinois, died March 20, 1945, aged 70 years.

Dr. Albert W. Roth, Tulsa, Oklahoma, died March 17, 1945, aged 71 years.

Dr. Joseph R. Wetherbee, Eugene, Oregon, died January 12, 1945, aged 73 years.

Dr. James E. Woods, Jackson, Georgia, died February 3, 1945, aged 76 years.

### MISCELLANEOUS

The Saint Louis Ophthalmic Society and the Department of Ophthalmology of Washington University offers an eight-months course for orthoptic technicians who will work under the supervision of ophthalmologists. The theoretical instruction will be given at the Oscar Johnson Institute and the practical work at the Saint Louis Ophthalmic Laboratory. The course is limited to three students; tuition \$300. For information write to the Saint Louis Ophthalmic Laboratory, Missouri Theatre Building, 634 Grand Boulevard, Saint Louis 3, or to Dr. Lawrence T. Post, 640 South Kingshighway, Saint Louis 10.

The Columbia University College of Physicians and Surgeons in conjunction with the National Society for the Prevention of Blindness held a conference in industrial ophthalmology from May 7th to 11th. This course, conducted in

support of the government program for better visual conditions in industry, was opened by Dr. Willard C. Rappleye, dean of the Columbia University College of Physicians and Surgeons. Those participating in conducting the course were: Dr. Albert C. Snell, Rochester, New York, "Industrial challenge to ophthalmology"; Charles P. Tolman, New York, "Eyesight in industry"; Gertrude Rand, Ph.D., and W. G. Darley, New York, "Illumination from the viewpoint of ophthalmology and of industry"; Dr. Hedwig S. Kuhn, Hammond, Indiana, "Prescriptions for occupational glasses"; Joseph Tiffin, Ph.D., "Job analysis for visual requirements"; Faber Birren, New York, "Use of color for simplifying the visual task"; Lt. Comdr. Walter E. Fleischer (MC), "Welding hazards"; Dr. Leon H. Whitney, Brooklyn, "Vision, engineering, and management"; Dr. Charles F. Kutscher, Pittsburgh, "Industrial toxic compounds, hazards, and treatment"; and Dr. James M. Carlisle, Rahway, New Jersey, "Industrial first aid in chemical injuries of the eye."

Drs. Conrad Berens, Joseph Lo Presti, and Le Grand Hardy participated in a symposium on screening methods for industrial visual characteristics.

#### SOCIETIES

At the regular meeting of the Milwaukee Oto-Ophthalmic Society, held on April 24th, Dr. John R. Lindsay presented a paper, entitled "Ménière's disease."

The forty-third meeting of the Reading Eye, Ear, Nose, and Throat Society was held on March 21st at the Wyomissing Club, Reading, Pennsylvania. Dr. George M. Coates, Philadelphia, spoke on "Osteitis and osteomyelitis of the frontal bone."

The following officers were elected for the next fiscal year: Dr. Isaac B. High, president; Dr. C. W. Bankes, first vice-president; Dr. Michael J. Penta, second vice-president; Dr.

Paul C. Craig, secretary; and Dr. John M. Wolring, treasurer.

At the April meeting of the Cleveland Ophthalmological Club Dr. Alan C. Woods, ophthalmologist-in-chief of Johns Hopkins University, spoke on "The pathogenesis and treatment of ocular tuberculosis." The officers elected for 1945 were: Dr. Paul Motto, president; Dr. James T. Collins, vice-president; and Dr. H. H. Wyand, secretary and treasurer.

#### PERSONALS

Dr. Lonis G. Hoffman has been appointed acting chairman of the department of ophthalmology of Loyola University School of Medicine, succeeding the late Dr. Carl F. Schaub.

On November 15, 1945, Col. Derrick T. Vail will deliver the next deSchweinitz Lecture before the Section on Ophthalmology of the College of Physicians of Philadelphia.

The Society of Kellogg Fellows of the Pan-American Congress of Ophthalmology was formed to help in bringing about a close relationship between the ophthalmologists of the Americas, and to aid in raising the level of the theory, practice, and teaching of ophthalmology in the Western Hemisphere. The society met last October, adopted the statutes of the organization, and elected the following officers: honorary president, Harry S. Gradle, M.D. (U.S.A.); president, Manoel da Silva, M.D. (Brazil); secretary, Olga Ferrer, M.D. (Cuba).

The membership of the society is now composed of 28 Kellogg Fellows from the following 18 countries: Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Paraguay, Peru, Puerto Rico, and Venezuela.—Olga Ferrer, Secretary, Institute of Ophthalmology of the Presbyterian Hospital of the City of New York.

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## AN EVALUATION OF VISUAL-ACUITY SYMBOLS\*

WALTER H. FINK, M.D.

*Minneapolis, Minnesota*

The testing of visual acuity is one of the most important procedures employed in an ophthalmologist's office. It is important not only because it is used so frequently, but also because many of his decisions depend upon its outcome.

Because of its importance, consideration should be given to its accuracy. A survey of the procedures for testing vision in common use today reveals that considerable inaccuracy is involved, and that the testing of vision is one of the most loosely conducted tests. The method employed is comparable to measuring distances with yard sticks of variable lengths. As compared with measurements used by scientists in other fields, it would be classed as an unscientific test, just a rough approximation. It is unfortunate that such a fundamental procedure should be so scientifically inexact. Such inexactness in other scientific fields would be held in contempt and promptly discarded.

Although we have developed instruments and methods of great precision in other phases of our work, we are still employing the visual-acuity methods advocated by Snellen<sup>1</sup> more than 80 years ago. A review of the literature on the subject reveals that the first fundamental contribution to the subject was made by Snellen in 1862, when he published his first "optotypes," constructed to subtend

an angle of five minutes. To him belongs the credit of having introduced characters arranged on a definite scale. Following the work of Snellen, various contributions to the subject were made, the most significant of which were those of Landolt and Ewing. In 1888, Landolt introduced the broken-circle test; in 1902, Ewing<sup>2</sup> contributed a chart that was an improvement over those employed previously.

In 1909 the broken-circle of Landolt was adopted as the standard international test object, by which all other test objects were to be graded. In 1916, the Ophthalmic Section of the American Medical Association<sup>3</sup> approved the selection of certain characters as standard. In 1919, Evans<sup>4</sup> brought out a chart in which the characters had a body structure based on the Landolt circle. In 1925, the National Society for the Prevention of Blindness adopted the Snellen "E" as the preferred method for testing the vision of children.

At intervals since this time various efforts have been made to increase the efficiency of the test charts. The significant recent contributions are the works of Cowan, Berens, and Verhoeff. In 1928, Cowan<sup>5</sup> constructed a chart in which the letters selected conformed more accurately to the physiologic requirements of the standard test object. In 1937, Berens<sup>6</sup> presented a chart with figures in colors designed for the testing of illiterates and children. In 1938, Verhoeff<sup>7</sup> presented an original idea in a chart consisting of circles of varied sizes. When we consider

\* Thesis (condensed) submitted for membership in the American Ophthalmological Society, 1944.

the importance of visual acuity in ophthalmology, and the comparatively small amount of research that has been done on it as compared with other phases of our specialty, it suggests that the subject justifies more serious consideration.

There is a tendency on the part of many ophthalmologists to consider the visual-acuity problem from only the eye specialist's standpoint, and to lose sight of the fact that it is a problem involving practically all phases of medicine. The entire field of medicine looks to us for leadership, and the attitude assumed by it is dependent upon ours. Consequently, when there exists a diversity of opinion among ophthalmologists as to the reliability and proper method of giving the visual test, it is not surprising that this lack of a definite policy has resulted in indifference toward the test on the part of the general physicians, pediatricians, welfare workers, and the school nurses. It is important to remember that these people come in contact with prospective patients long before the eye physician is consulted. An indifferent attitude toward the testing of visual acuity is to be deplored, and the test should be popularized to the fullest degree.

It should be emphasized in all fields of the profession how fundamental the testing of vision is, especially in that of preventive medicine, for visual-acuity checks lead to the early recognition of defective eyes. That more frequent routine visual checks are necessary is evident, if we can depend upon statistics. It has been stated that 1 in 25 children has his visual acuity tested. In a public health report which gives the results of testing 9,245 children, it was found that 40 per cent of those tested did not measure up to the normal standard. It is apparent that only a small percentage of the people have their visual acuity tested and that many important ocular problems are being over-

looked. This is especially true in the case of children, wherein early precautions will prevent many unnecessary eye problems. If a standardized method existed, and if the importance of the visual-acuity tests were sufficiently emphasized, much permanent ocular damage could be prevented. It is, therefore, the problem of the ophthalmologist to emphasize to the other medical workers the importance of visual-acuity testing, but in so doing we must recommend a method that is not only efficient in the time involved but also in its accuracy. It behooves us as ophthalmologists to keep in mind the fact that we are looked to for guidance in this important phase of medicine, and our attitude toward it can determine the attitude of the profession as a whole.

If we assume the responsibility of advising others correctly as to this procedure, we must, in fairness, do our utmost to present a scientifically exact method. The first step in this direction calls for a definite knowledge of the reliability of our present methods as a scientific test. However, in analyzing the situation, most of us will agree that the visual-acuity test as used today is inaccurate, and that most of the inaccuracy of the test rests with the symbols used.

It seems obvious, therefore, that visual-acuity examinations will achieve greater accuracy if the symbol is improved. It should be standardized like other procedures in ophthalmology, so that the same symbol and technique are used in all offices instead of the great variety in use today. Granting the importance of surrounding conditions such as illumination, distance, and like factors, it must be conceded that great possibility of inaccuracy rests with the symbol.

The purpose of this presentation is, therefore, an attempt to clarify the situation by evaluating the various symbols in common use today.

## PROCEDURE

In approaching the problem, it must first be recognized that the testing of visual acuity and of refraction calls for different types of symbols. Instead of attempting to use the same symbol for both procedures, thereby sacrificing efficiency, a symbol should be constructed for the specific purpose of testing vision. In addition, this symbol, although following certain fundamental principles, should be varied according to the age of the patient. It is evident, for example, that the judgment of a child under six years of age is not equal to that of an older person. Not only the symbol but also the technique must be altered in accordance with the age of the subject.

It is apparent that the various symbols now being used to test vision may be classified into two groups. The first comprises those symbols which use the Landolt broken circle as a basis; the second group, those using letters of the alphabet or numerals as a basis. The popular symbols used today are of the second group, in spite of the fact that the ophthalmic section of the American Medical Association in 1916 adopted the Landolt circle as the accepted symbol.

To evaluate the various symbols properly the requisites for an ideal test symbol should be borne in mind; namely, 1. The test should be standardized so that the results obtained will be uniform. The 1- to 5-minute requirements of the Snellen scale are considered standard. The 5-minute requirement refers to the overall size of the letter and the 1-minute requirement to the size of detail that has to be discriminated. 2. The target should be accurately constructed as to size, color, background, and should have the proper illumination. 3. The target should be understandable—a simple task of judgment. 4. The target should be interesting to the patient. 5. Targets of the same size

should not vary in visibility. 6. The target cannot be memorized. 7. It should be possible to test at will any meridian desired. 8. The judgment required should be in terms of acuity and not of recognition. 9. It should be used only for testing the vision, not also the refraction. 10. The test should not produce fatigue. 11. There should be sufficient divisions and equality of steps throughout the scale. 12. The test should be adjustable to different ages. 13. Changing the accommodation from distance to near objects should be unnecessary. 14. It should not be necessary to learn the names of the target. 15. Targets should not be too close together.

## METHOD OF PROCEDURE

The investigation, which consisted of an evaluation of various symbols, is divided into two parts:

Part A consists of the various methods in use today.

Part B consists of methods as suggested by the author.

## PART A

The symbols selected were classified into four groups, based upon age, for age is, as a rule, indicative of the ability possessed by an individual to analyze the various symbols.

Group I consisted of symbols understandable to patients 11 years of age and older; group II, of symbols understandable to patients 7 to 11 years of age; group III, of symbols understandable to patients 5 to 7 years of age; and group IV, of symbols understandable to patients 3 to 5 years of age.

For each group, 25 patients were selected, and an effort was made to have the selection of these patients based on at least an average degree of intelligence and coöperative attitude. This seems to be essential in order to attain a higher degree of accuracy. A small group of this type of

patient would serve better to evaluate the symbols accurately than would a large group of patients varying in intelligence and coöperation. Because of the small number of patients, nothing conclusive is possible, and the findings can be considered only suggestive.

The symbols were exposed at 20 feet from the patient, and one eye at a time was tested. The illumination used was 15 foot candles. All effort was made to have other conditions as conducive as possible to the obtaining of accurate results.

Each individual of the first three groups was tested three times at 5-minute intervals. In the fourth group each patient was tested but once for each chart because of the difficulty encountered in maintaining sufficient concentration.

In selecting charts for comparison, it was considered impractical to compare all the charts on the market. The charts selected for comparison were those that served to illustrate certain individual principles, or that could be considered representative of a group of charts. In this way, much repetition was avoided.

In the first series, which consisted of patients 11 years and older, the following charts were used: 1. Standard Capital Letter chart with the A.M.A. ratings and published by Bausch and Lomb. 2. Cowan chart. 3. Verhoeff chart. 4. Landolt broken-circle chart. 5. Ferree-Rand chart.<sup>8</sup>

In the second group of patients, whose ages varied from 7 to 11 years, the following charts were compared: 1. Standard Capital Letter chart of Bausch and Lomb. 2. Cowan chart. 3. Landolt broken-circle chart. 4. Ferree-Rand chart. 5. Snellen "E" chart.

In the third group of patients, whose ages, varied from 5 to 7 years, the following charts were used: 1. Standard Capital Letter chart of Bausch and Lomb. 2. Waugh chart.<sup>9</sup> 3. Gardner chart. 4. Jackson incomplete-square chart.<sup>10</sup> 5.

Snellen "E" chart. 6. Landolt broken-circle chart.

In the fourth group of patients, in which the ages varied from 3 to 5 years, the following charts were used: 1. Berens chart. 2. Evans chart. 3. Bailey-Peckham chart. 4. Beber chart. 5. American Optical Co. chart. 6. Ewing chart. 7. Seitz chart. 8. Cooperman chart. 9. Snellen "E" chart. 10. Landolt broken-circle chart.

Following the investigation of the various symbols under consideration, one is impressed by the fact that no one of them may be regarded as entirely satisfactory.

In considering the first group, it is apparent that the capital-letter type of symbol is unsuited for testing visual acuity.<sup>11</sup> The popularity of the capital-letter chart derives from the fact that it is better known and is considered the standard test for visual acuity in adults. In addition, it is readily understood by the patient and easily executed. Its popularity cannot be based upon its reliability of results, for the letters have a variable visual value. Because of their structure, the element of conjecture enters, and the visual acuity is overestimated. Inability to reproduce results is also a factor against its use.

The Cowan chart, although having certain noteworthy features, cannot be considered sufficiently superior to justify its adoption.

The Verhoeff chart has several unique features but, as found in this group, did not prove to be sufficiently practical to justify its adoption.

In comparing the Landolt circle having the single break with that having the double break, it appears that the double-break circle of the Ferree-Rand chart is the more practical.

The Landolt circle of Ferree and Rand seems therefore to be the symbol of choice for the first age group.

In the second group the Snellen "E" seemed to be superior to the Standard Capital Letter chart in ease of performance and recognition.

When the Snellen "E" is compared with the Landolt circle with the double break, it is clear that in symbols of the same size the value of the visual reading does not correspond. The "E" gave better visual readings and the element of conjecture entered very strongly. The broken-circle symbol was more consistent in reproducing results and conformed more closely to the recognized standards. It was, however, more difficult to understand for this group than was the Snellen "E." It seems possible that if more publicity were given the double broken circle it would be as well accepted as is the "E" symbol.

In the third group, the Waugh, Gardener, and Jackson symbols were considered. These symbols did not offer any noteworthy advantage as compared with the other symbols. In the case of the Standard Capital Letter chart, the inaccuracies found in this younger group of patients were more in evidence than was the case in the two foregoing groups. The Snellen "E" chart was readily understood, but the previously mentioned inaccuracies were more in evidence.

The Landolt circle was more confusing and required more explaining than did the Snellen "E." The response when the Landolt broken circle was used was more consistent than was the case in the other methods.

In the fourth group the responses to the picture charts were not accurate when compared with the responses to the Snellen "E" and the group required more coaching. The Landolt broken circle did not prove to be so easily understood as was the "E" symbol, but where it could be used, it gave more consistent results.

After considering all the evidence as found in this analysis, one is led to con-

clude that in the various groups examined the Landolt circle with the double break is the most accurate symbol. Although somewhat more difficult for the patient to understand than are some of the less accurate charts, this factor should not cause it to be replaced.

A comparison of results, however, does not show in a convincing way that the ultimate in visual-acuity symbols has been attained.

## PART B

In this section, a series of symbols is presented which consist of modifications of various methods in present-day use.

The following modifications in the type of symbol are made because they offer another approach to the problem. The suggestions are purely experimental and await more extensive confirmation before they can be considered as an improvement over symbols in present-day use. Various suggestions are also made concerning the technique of presenting the tests.

It is, therefore, with the hope of eliminating some of the objections to the present-day symbols, and with the object of making a symbol which is designed specifically and wholly to test visual acuity, that the following suggestions are presented and in the following sequence:

1. Circular "E" chart.
2. Circular Landolt broken-circle chart.
3. Landolt broken-circle chart with a variable number of breaks.
4. Modified pictograph chart.
5. Modified Sjögren hand chart.

## CIRCULAR E CHART

The first suggestion has to do with the deviation from the usual technique of using the Snellen "E" chart.

According to the accepted technique, a chart is used upon which is printed the symbol "E" in various sizes and positions. The symbol is usually pointed either up,

down, or to one or the other horizontal positions. The first row has one symbol, the second has two, and so forth.

### *Technique of using the Circular "E" chart*

**Test Object:** The symbol "E" is printed on both sides of a circular piece of white

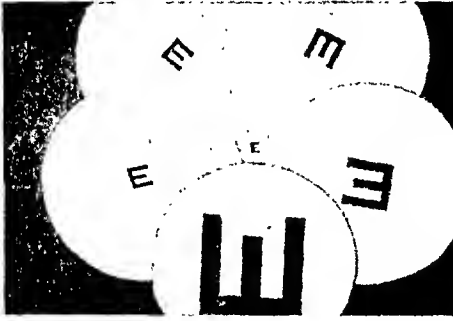


Fig. 1 (Fink). Circular "E" chart.

reflex-free cardboard which is six inches in diameter. A greater number of gradations in the size of the symbol is employed than in the standard chart (fig. 1).

**Method:** The circle is held in front of a plain surface where the illumination is uniform. The patient indicates with his hand the position of the symbol. The shifting of position is not seen by the patient. The smallest symbol correctly seen indicates the visual acuity of the eye being examined.

**Comments:** This method has certain advantages over the usual Snellen "E" chart: By having a greater variation in the size of the symbol, a more accurate estimation of the vision is possible. The test can be made more rapidly than is possible with the other method and numerous exposures can be presented. This gives a truer estimation of the visual capacity of the eye.

The circular chart is more flexible. Whereas the fixed symbols on the chart are usually horizontal or vertical, the circular chart can be placed in any position desired, thus making possible the oblique

in addition to the vertical and horizontal positions.

It is more understandable and more attractive to the child because it can be explained by placing the card in his hands. It is less distracting to the child because the chart is simpler than the standard "E" chart.

The vision of the child can be checked at home periodically by giving the parents a symbol.

### CIRCULAR BROKEN-RING CHART WITH THREE BREAKS

The symbol is placed on a circular piece of cardboard as previously described. The ring conforms to the Snellen specifications and has three breaks, with intervals of one minute between the breaks (fig. 2). The patient indicates with his fingers the direction of the breaks.

**Comments:** It fulfills most of the requirements for an efficient method. It is flexible, and numerous variations in positions are possible. It can be made in finely graduated steps so that an exact threshold of vision is obtained. It is simple to understand. It cannot be learned. It checks the



Fig. 2 (Fink). Circular broken-ring chart with three breaks.

various meridians for astigmatism. It can be used for patients of all ages.

### MODIFIED LANDOLT CIRCLE WITH A VARIABLE NUMBER OF BREAKS

The chart consists of a series of Landolt circles in 17 graduated sizes con-

structured so that there is a more equal variation in the size of the target, thus avoiding large visual steps. (fig. 3).

The chart is designed on the principle of recognizing the number of openings in the circle rather than the position of one or two openings as is customarily done. The targets have 1-minute breaks which vary in number in each circle. A circle may have two, three, or four breaks. The sequence is varied so that it cannot be memorized readily. Each circle is sufficiently separate from the next, and confusion resulting from over-crowding is thus avoided.

*Technique:* In examining an older child or adult, the patient indicates the number of openings in each symbol as he reads across the line.

The test, although suited to older children and adults, can be used effectively for children as young as five years of age.

In examining a young child, it is necessary to give him some preliminary instruction at close range. He is shown a complete circle. The examiner clips small pieces of paper on the black circle and the child indicates the number of small white pieces by raising his fingers. After the child is familiar with what is wanted, the examiner, at a distance of 20 feet, using a window card, exposes one symbol at a time. The smallest line or symbols the child can recognize are an index of the vision.

The method of using this target can be varied, depending upon the mental development of the child.

*Comments:* The chart is designed for testing visual acuity only.

It permits a more scientifically exact estimation of vision than does the Standard Capital Letter or Snellen "E" chart. It conforms to the accepted standard. It has all the advantages of the Landolt circle with the additional advantage of testing more than one meridian at one

time, thus avoiding repetition and fatigue. It has none of the disadvantages of the "E" chart. It analyzes both the image-forming function (Snellen letters) and the detail discrimination (Landolt circle). It is easier to understand and report than is the Landolt circle, because designating the number of openings by number is much more certain, even with a child,

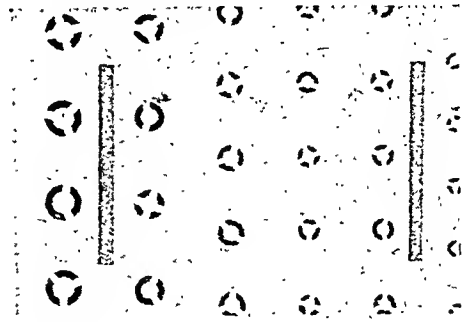


Fig. 3 (Fink). Modified Landolt circle with a variable number of breaks.

than indicating the position of one or two openings as is necessary in using the other Landolt symbols. Results are reproducible. It is unlearnable. There are two rows of symbols for the last three gradations. One line is used for each eye thus eliminating memorizing.

#### MODIFIED PICTOGRAPH METHOD

Due to the fact that a very young child does not understand the Landolt or Snellen "E" type of chart, it may be advisable to use a picture in testing the vision.

The modified picture method is proposed because it has certain advantages over other targets of this type, the two chief advantages being the method of presentation, and the comparatively close adherence to the Snellen specification. (fig. 4).

*Description:* Nine targets make up the set and are employed in the same manner as are flash cards. Each picture is made in seven sizes.



The pictures conform more accurately to the standard requirements than do other methods of this type.

*Technique:* The test is presented as a

a picture and the child selects a similar picture from a group placed in front of him. After the method is understood, the cards are exposed at 20 feet. The smallest

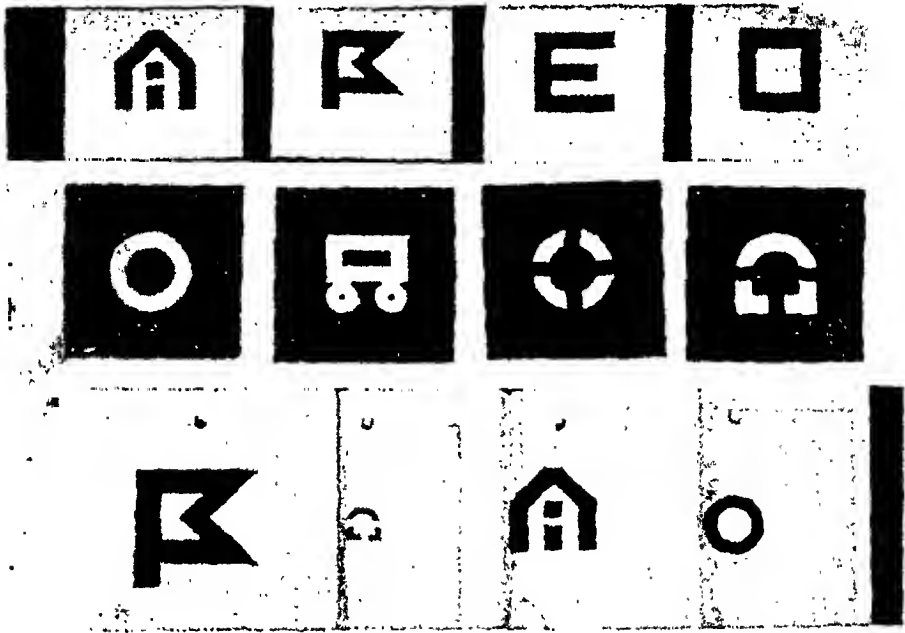


Fig. 4 (Fink). Modified pictograph method.



Fig. 5 (Fink). Modified Sjögren hand chart.

game, and the child must be unconscious of the fact that his vision is being tested.

— Nine pictures are placed before him. The examiner, standing near him, exposes

pictures recognized are an index of the vision.

*Comments:* The method is more easily understood than is the Bailey method and

more flexible. It is more accurate than are other pictograph charts. It can be carried out by a nurse. It will give a fairly accurate idea of the visual acuity in a very young child, when the other methods fail to interest him. To the child, the test is a game and arouses interest and coöperation. To note improvement in visual acuity in amblyopic eyes such a test will give concrete information. It can be repeated without becoming monotonous. It is a test to be used for the very young child where an approximate idea of vision is wanted quickly.

#### MODIFIED SJÖGREN HAND CHART

The symbol, in graduated sizes, is a picture of a solid black hand, printed on a circular card (fig. 5). The technique of using it is similar to that employed with the other circular cards.

*Comments:* The child understands this chart and requires very little preliminary training. The test does not conform to the standards. It can be used as a preliminary test to obtain an approximate idea of the vision. It can be used to arouse his interest before a more exact method is used, and has proved very practical.

#### OTHER CIRCULAR CHARTS

Various figures such as Mickey-Mouse, elephants, and others, may be used on the circular charts (fig. 6). Like the "hand chart," they are an approximate comparison of vision and can be used to advantage with the child when other methods have failed to interest him.

In summarizing the results obtained in comparing the Standard Capital Letter chart with the Landolt modifications, it is suggestive, judging from the results found in a small group of cases, that the visual-acuity readings are not comparable. It was definitely more difficult to read the Landolt symbol than the Capital Letter symbol for any given line. This difference

in vision averaged one line in most cases. In addition, the reading for the line was more consistent when the Landolt symbol was used.

In comparing the double-break with the variable-break symbol it was clear that the variable-break symbol was more easily understood and it seemed to indicate the

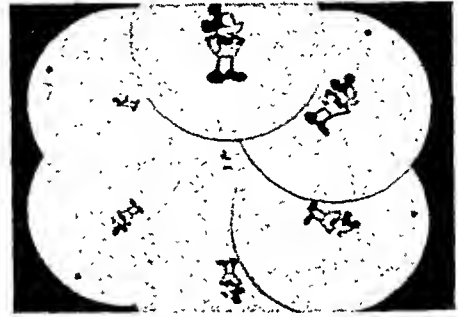


Fig. 6 (Fink). Pictograph method.

presence of an astigmatic error more definitely.

A comparison of the symbol "E" with the triple-break circle seemed to indicate that the triple-break-circle symbol was as easily understood as was the Snellen "E" and more exact in results.

The circle with the variable number of breaks was understandable also to the younger group.

#### CONCLUSION

Modern science rests upon the foundation of exact measurements. To persist in measuring visual acuity by a variable standard tends to lessen the accuracy of the work done and leads to erroneous conclusions.

Not only has there been no substantial change in the principles, test materials, and procedure of making the test since the days of Snellen, but even the principles laid down by him are not complied with in a great part of the testing that is now being done. Other phases of ophthalmology have made great advances since the time of Snellen. As stated by Ferree

and Rand<sup>12</sup> "It seems strange that a measuring scale which was established many years ago, when so little was known about acuity, should have remained so long with so little improvement." Our knowledge has advanced sufficiently in these matters to justify a revision in our methods.

In evaluating the various symbols now in use, it must be admitted that no one of them fulfills all the specified requirements of a perfect symbol. But before discarding them, an alternative should be offered—a practical one. Although a symbol may be scientifically correct, it may not prove to be popular because of the patient's difficulty in understanding it, and this makes a test time-consuming.

A satisfactory symbol must not only be accurately constructed but readily understandable, so that it will be efficient also from the standpoint of the time required for its use.

It seems evident that capital letters are not the best symbols for testing visual acuity. For this purpose they are entirely too variable. Not until the unfitness of letters for testing visual acuity is appreciated, shall we have visual-acuity records that are satisfactory. However, it must be admitted that in spite of the inaccuracies involved in using letters, they have certain desirable features; namely letters are understandable to the patient who can read, and the test requires very little time.

The Snellen "E," although adaptable to children and easy to use, is inaccurate and should be discarded.

The Landolt circle with either one or two breaks, although fulfilling many requirements, is not entirely practical. In many instances it is confusing to the patient; for not only does he not understand what is expected, but he has difficulty in reporting his observations.

However, taking everything into consideration, the double broken circle of

Ferree-Rand seems the most practical of all symbols now in use for patients who are over seven years of age, whereas the symbol "E" appears to be more practical for younger children.

The problem is, therefore, to develop a test chart and test method that will give accuracy, precision, and reproducible results. The requirements are aptly stated by Ferree and Rand<sup>12</sup> as follows: "Obviously, if ratings are to be made and norms established, the task would be greatly facilitated by adopting a single test object of suitable form or type. To do this, it is necessary to construct a scale, the divisions of which would set tasks for the eye's powers of discrimination. For such a scale, there should be a selection of a suitable type of test object properly graded and distributed, as to size, a standard color, and intensity of illumination, standard coefficients of reflection of object and background, and a standard coefficient of gloss or finish for the card-board or other background on which the test objects are presented."

In the hope of fulfilling some of these specifications, the author has submitted for more extensive study, the various modifications previously enumerated. After using these methods for several years, he is convinced that the suggestions have possibilities.

The Landolt-circle symbol with the variable number of breaks should be considered as a method for testing patients who are seven years of age and older. It fulfills most of the requirements of a perfect symbol because it has the following advantages: It is constructed to the exact Snellen specifications. The results obtained are uniform and reproducible. It offers a simple task for the judgment; simpler than the other Landolt type of symbols. It is interesting to the patient. The symbols are of the same size and do not vary in visibility. They cannot

be memorized. They test the various meridians readily. The judgment is in terms of acuity and not of recognition.

The symbol is designed for testing acuity only, not refraction. It does not produce fatigue. There are sufficient divisions and equality of steps throughout the scale. It is adjustable to different ages. It is not necessary to learn the names of the targets as they are indicated only by numbers.

In the case of patients under seven years of age, the triple-break Landolt circle should replace the Snellen "E" because it is more accurately constructed and is as easily understood.

For very young children, the modified pictorial chart has possibilities.

For the indifferent child whose interest

cannot be aroused, the Sjögren hand chart or other modifications, such as Mickey Mouse, may be of value in obtaining some measure of coöperation or at least some idea of the visual acuity.

In spite of analysis, experimental proofs, and the findings of committees, many examiners will continue to use what they are accustomed to. The force of many years of habit is strong and difficult to overcome. Unfortunately, because of lack of restriction and supervision, almost any type of test chart may be used with any type of technique.

Ophthalmologists as a group should decide upon a standard method of testing visual acuity, and publicize the importance of the test.

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# INFLUENCE OF SELECTED SPECTRAL DISTRIBUTION ON THE GLARE EFFECT, STUDIED BY MEANS OF DARK ADAPTATION\*

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Due to the practical importance of the glare effect of artificial illumination in industry and traffic, a great number of investigations have been performed especially during the past 25 years. It is clear that only the interference of glare with definite visual functions can be exactly measured, although the sensation of discomfort should not be neglected in the appraisal of the light source. Both effects are not always parallel.<sup>1</sup> Various methods have been used to study the interference of glare with visual functions, such as the interference with visibility and its components, the visual angle, the brightness threshold and brightness contrast;<sup>1,2,3,4</sup> the brightness difference perception;<sup>5</sup> the measurements of the apparent angular diameter of the halos surrounding the retinal images of the glare sources;<sup>6</sup> the recovery of brightness difference perception<sup>5</sup> and of visibility;<sup>4</sup> the subjective brightness and fading of after-images.<sup>7</sup> It is surprising to note that dark adaptation has been used very little for the comparative study of glare effects, although the threshold sensitivity to light appears to be a direct approach to this problem. This might be due to the fact that dark adaptation was first measured in 1903;<sup>8</sup> and a satisfactory method was not developed before 1921.<sup>9</sup> Nevertheless, there is ample experimental material to justify the use of this method for a comparative study of the glare effect. The adaptation curve affords several in-

dices for analysis of the glare effect. With increasing brightness, the speed of dark adaptation slows down, and there is an alteration in the shape of the curve.<sup>10,11,12,13</sup> When one uses white light for the test patch (the results with colored lights will be discussed later), the dark-adaptation curve at first drops rapidly, and then slows down, so that a plateau is approached. This plateau is somewhat manifest and prolonged after exposure to a bright light. The plateau, indicating the final level of cone adaptation, is followed by a rapid drop, due to the first rapid part of rod adaptation. The transition point between cone and rod adaptation, which occurs between five and nine minutes of dark-adaptation time, is a sharp break after adaptation to bright light and an important criterion for visual function.<sup>11,14</sup> After exposure to dim light, the dark adaptation is more rapid, and no plateau or transition point occurs, so that cone and dark adaptation cannot be separated. With increasing brightness of the preceding light exposure, the separation between cone and dark adaptation becomes more manifest together with the prolongation of dark-adaptation time. Mandelbaum<sup>14</sup> explains the different shape of the curves with the assumption that regeneration of the visual purple may take place directly from retinene in a relatively rapid manner or by a slower route through vitamin A, and that the brightness of the adapting light may determine which of these reactions will predominate. We restricted our measurements to cone adaptation and the first part of the rod adaptation, so that the

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transition point could be determined. The restriction to cone adaptation appeared to be appropriate not only because of the practically much more important role of photopic vision but also because, according to Hecht, Haig, and Chase,<sup>12</sup> the range of rod dark adaptation remains unchanged with increasing brightness of light adaptation, although its appearance is more delayed with the level of light adaptation, "as if the rod curve as a whole were moved so as to appear later the higher the light adaptation."

In an earlier study,<sup>16</sup> the more rapid rise in the fusion frequency of flicker with increasing brightness of a new illuminant (lamp B, Verd-A-Ray) in which the radiation is reduced at both ends of the visible spectrum without appreciable reduction between 5,400 and 5,600 AU,\* compared to usual frosted lamps (lamp A) was interpreted as possibly due to a lesser glare effect of lamp B. We thought it worthwhile to compare the glare effect of lamp B and lamp A by a more direct approach, using the dark adaptation.

Several studies have been made on the influence of more or less monochromatic light on the effect of glare. The reduction in visibility<sup>6</sup> due to glare is somewhat greater for sodium light than for tungsten light for angles less than 5 degrees between the glare source and the line of vision, probably due to the halos surrounding the source of glare.

No difference was observed for greater angles. No significant differences of the

glare effect on visibility, determined by the threshold brightness of a circular test object for three different constant brightnesses of the background, could be seen when comparing tungsten light with moderately colored lights (canary, amber, light blue). However, in a modified visibility test (variation of the brightness of the glare source to determine threshold contrast visibility) the average candle power of an amber glare source could be about 14 per cent greater than that of white light.<sup>17</sup> Mandelbaum and Mintz's important results<sup>15</sup> will be considered in a later part of this paper.

Because of the present wide use of dark adaptation, individual and daily variability has been considered and analyzed in several recent papers<sup>14,18,19,20</sup> which will be considered in the discussion of the results.

#### METHOD

For our experiments we used Newton's<sup>21</sup> adaptometer. This instrument measures a visual threshold range from 10 to 0.05 millifoot candles (M.F.C.); that is, the total range of cone adaptation and the first (rapid) part of rod adaptation. The test patch of one-third degree of visual angle was 5 degrees above the small fixation point. The fixation point was illuminated with red light, the test patch with white light. In this instrument the color of the test patch does not change at different levels of illumination, because the illumination was varied by changing the reflecting angle of the light source onto the test patch. All experiments were performed from the same dark adaptation level of 0.05 M.F.C. No artificial pupils were used; according to Mandelbaum<sup>14</sup> the use of artificial pupils in normal subjects with normal pupillary reflexes does not produce any essential change of the dark adaptation except that artificial pupils tend to slow down some-

\*Briefly, the spectral distribution of this illuminant may be characterized in percentage of incandescent frosted lamps at different wave lengths: complete absorption at 4,000 AU, 53-percent reduction at 4,200 AU, 30-percent reduction at 4,400 AU, 24-percent reduction at 4,600 AU, gradually diminishing to 6-percent at 5,000 AU and 3.5-percent at 5,200 AU; no appreciable reduction between 5,400 and 5,600 AU, and 3.5-percent reduction between 5,800 and 6,800 AU.

what its total duration. Mandelbaum presents data to calculate the dark-adaptation data for any standard size of artificial pupil from data obtained without artificial pupils. Since we compared the same subjects under otherwise equal conditions, such calculation did not appear to be essential for comparison.

The experiments were performed on three subjects after two months of preliminary training. For light adaptation, we used a wooden box with the bulb fixed centrally in the back opposite a plate of frosted glass (8 by 8 inches). The eyes of the observer were kept at constant distance from the illuminated glass plate. Two series of bulbs of different wattage were used [usual frosted lamp, Mazda (lamp A); and Verd-A-Ray bulbs (lamp B)]. Binocular presentation was used. Two series of experiments were performed; in series I, the lamps A and B were compared at the same distance of 6 inches from the illuminated glass plate. Four levels of brightness were obtained with 60-watt, 100-watt, 200-watt, and 300-watt lamps. For lamp A, 125, 200, 590, and 1,050 foot-candles were obtained as compared to 95, 175, 475, and 800 foot-candles with lamp B. It can be seen that the illumination level is about 25 percent lower with lamp B. In a second series of experiments, we compared the lamps B at the same brightness level as lamps A. For this purpose we shortened the distance between eye and illuminated glass plate for lamp B until the same brightness level was obtained as for lamp A. By this procedure, the visual angle of the illuminated area was enlarged. Since the visual angle was already large at 6-inch distance, and far exceeding that included by fixation point and test patch in the adaptometer; the magnification produced by the shorter distance does not materially effect the experimental results.

All investigators working with bright

illumination levels have experienced difficulties in reading-threshold levels because of afterimages (Müller,<sup>22</sup> Mandelbaum<sup>14</sup>). Although afterimages are themselves a glare effect, they concern obviously different visual processes and may seriously interfere especially with the first reading after light exposure, naturally more so at the higher brightness levels. After some training, it is possible to recognize the test patch through the afterimages. Even so, the first reading is usually the least accurate (Hecht,<sup>11</sup> Mandelbaum<sup>14</sup>). The afterimages disappear more rapidly when the eyes remain closed between the readings. The intensity of afterimages was reduced by preexposure with closed eyes for one minute at the two lower brightness levels (1 and 2) and for two minutes at the two higher brightness levels (3 and 4).

This procedure was advantageous also for another reason. The immediate change from complete darkness to a bright illumination with open eyes produced lacrimation and blepharospasm with a rapid blinking rate. Especially at the higher brightness levels, lacrimation and rapid blinking rate are an effective protective mechanism against glares, reducing considerably the actual exposure time. Luckiesh and Moss<sup>23</sup> have experimentally demonstrated the increase of the blinking rate with glare.

This procedure has theoretically the disadvantage that a certain amount of diffuse light penetrates the eyelids and produces a certain degree of light adaptation. During the preexposure, however, the amount of light penetrating the eyelids is surprisingly small, even at higher brightness levels, as we found in an additional series of experiments.<sup>24</sup> In any case, the comparison between the two arrangements (lamp A and lamp B) is valid, since the experimental procedure was the same.

The same arrangement (brightness

levels) was compared with lamp A and lamp B on the same day. In subjects ES and SB only two experiments were made in one day. Therefore, the experiments with series I (equal distance, different brightness) and series II (equal brightness, different distance) were made on different days. With subject SS, whose adaptation time was much faster, both series were performed on the same day. There is unanimity of opinion that variations of dark adaptation, tested under otherwise equal conditions on the same day, are insignificant.<sup>14,22</sup> The experiments were repeated on different days with a different sequence of lamps; that is, when lamp A had been tested before lamp B in the preceding experiment, lamp B was taken first in the subsequent one. The average values were calculated from two to four different experiments, performed on different days, the number of experiments being determined by the magnitude of daily variations.

The first reading was the time when the threshold of 10 M.F.C. could be seen. Subsequently, a reading was taken each full minute from the end of the exposure. When the threshold dropped to a value between 0.3 and 0.1 M.F.C., more frequent readings were taken in order accurately to determine the time for recognition of the final value of 0.05 M.F.C.

In addition to these experiments, 32 normal subjects with normal or fully corrected vision were investigated. These subjects were not trained for dark adaptation, but most of them served as subjects in other visual tests (visual acuity, fusion frequency of flicker). Before the actual experiment, an experiment was made in order to familiarize the subject with the procedure. Lamps A and B were used at an equal brightness of 125 F.C. In half of the subjects lamp A was examined first, in the other half lamp B. The experiment was repeated after one to three weeks' interval, with an order of

lamps reversed as used in the first experiment. Several subjects were investigated three times.

## RESULTS

Each dark-adaptation curve was plotted with log threshold as ordinates against the adaptation time as abscissae. From these curves, the dark-adaptation time at 10 M.F.C., at 1 M.F.C., and at 0.05 M.F.C. and at the transition point was determined. Figure 1 shows the average values of dark-adaptation time until

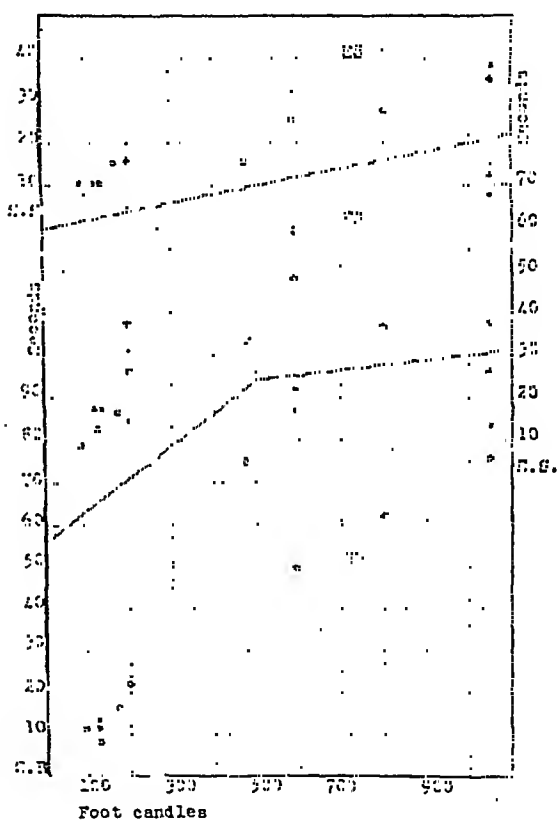


Fig. 1 (Simonson et al.). Time of recognition of 10 M.F.C. (ordinate) dependent on the level of preadaptation brightness (abscissa). In the upper part of the graph are the data of subject SS (upper left ordinate), in the central part those of subject ES (right ordinate), and in the lower part those of subject SB (lower left ordinate). The data are average values; the results obtained with lamp A are marked by solid dots (series I) and + (series II); those obtained with lamp B are marked by small circles; where the values of series I are 95, 170, 475, and 800 foot-candles and the values of series II at the same brightness levels as with lamp A.



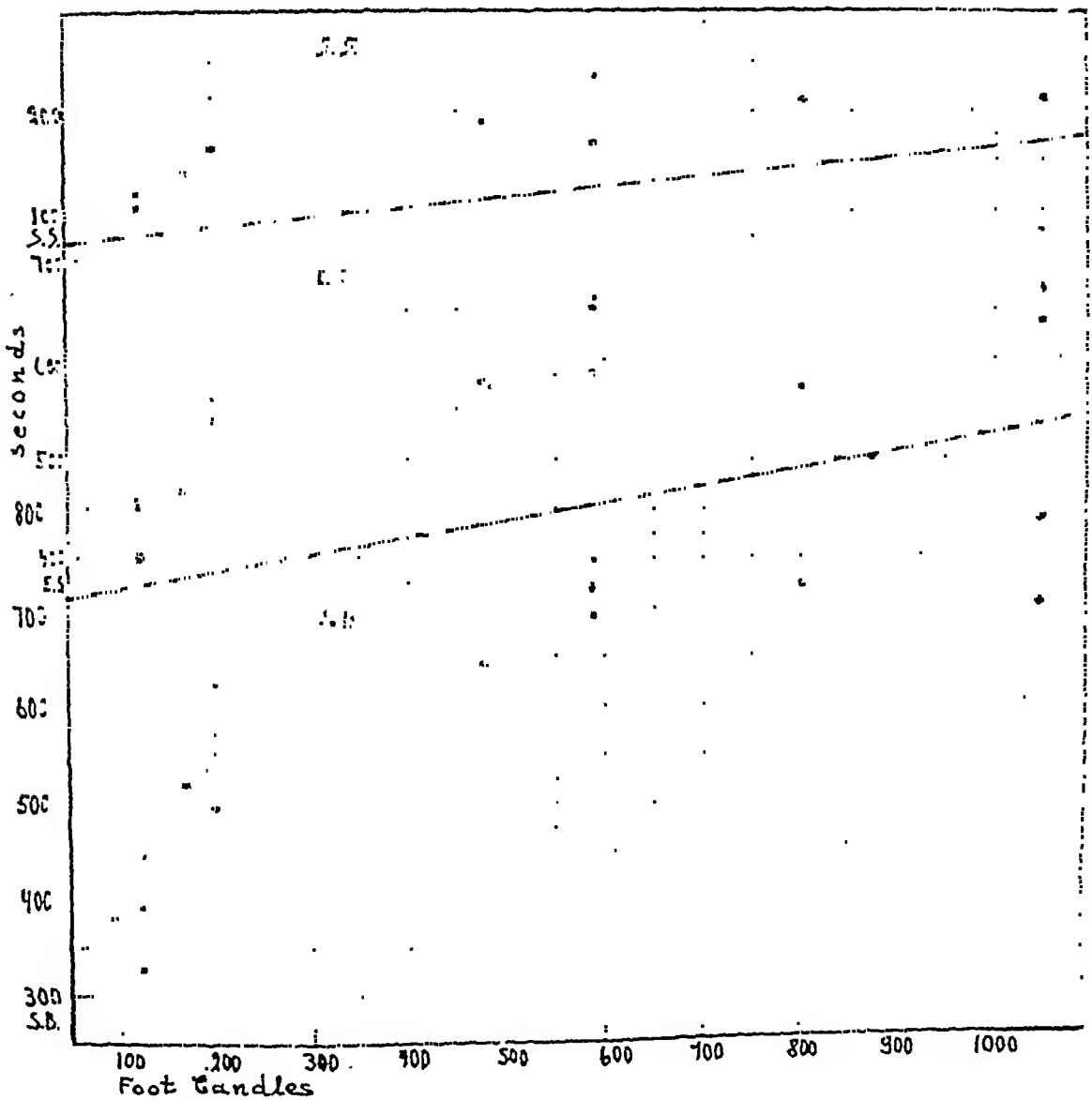


Fig. 2 (Simonson et al.). Dark-adaptation time until recognition of 0.05 M.F.C. (ordinate) dependent on the level of preadaptation brightness (abscissa). In the upper part of the graph are the values of subject SS, in the central part those of subject ES, and in the lower part those of subject SB. The data are average values; the results obtained with lamp A are marked by solid dots (series I) and + (series II); those obtained with lamp B by small circles, the values of series I at 95, 170, 475, and 800 M.F.C., the values of series II at the same brightness levels as with lamp A.

recognition of 10 M.F.C. as ordinates (seconds) plotted against the level of preadaptation brightness (foot-candles) as abscissas. Each value is the average from two to four experiments, performed on different days. In series I, lamp A (solid dots) was measured at 125, 200, 590, and 1,050 foot-candles and com-

pared with lamp B at 95, 175, 475, and 800 foot-candles (small circles); in series 2, lamp A (crosses) and lamp B (circles) were compared both at 125, 200, 590, and 1,050 foot-candles. In subject SS (upper part of the graph) both arrangements were investigated on the same day. In all three subjects dark-adaptation time.

tended to be shorter after exposure to lamp B than after exposure to lamp A throughout all levels of brightness except the lowest level in subjects SS and SB (lowest part of figure 1), where the duration was so small that the values were equal within the experimental error. It is known that the first values usually are the least accurate (Mandelbaum), owing to the interference of afterimages. Our procedure did not eliminate afterimages entirely, although it reduced their interference. The increase of the adaptation

ducing the effective light exposure. In general, the rate of the increase of the adaptation time is reduced as the higher brightness levels are reached. This reduction is somewhat less obvious when a logarithmic scale is used for the abscissa but is still present.

As in figure 1, with the initial values of 10 M.F.C., the increase of dark adaptation time with increase of the pre-adapting brightness was most pronounced with subject SB and least pronounced with subject SS. Again the individual

TABLE 1  
AVERAGE, STANDARD ERROR, AND SIGNIFICANT RANGE OF DARK-ADAPTATION TIME AT 0.05  
M.F.C. OF LAMP B IN PERCENTAGE OF LAMP A

Subject	Series I			Series II		
	Average Percent	SE	Range	Average Percent	SE	Range
SB	85.6	2.956	76.73-94.47	87.9	4.272	75.08-100.72
ES	85.3	2.52	77.74-92.86	88.0	1.862	82.41- 93.53
SS	77.7	5.326	61.72-93.68	83.1	3.317	73.15- 94.05
Total	84.2	1.86	78.62-83.78	85.7	1.90	80.00- 91.40

time with the increasing brightness of preceding light adaptation was most pronounced with subject SB, least pronounced with subject SS, who had the fastest dark adaptation speed. The different individual adaptation rates do not appear to influence the tendency toward shorter values with lamp B.

Figure 2 shows the average values of the three subjects for the recognition time of 0.05 M.F.C. as ordinates, plotted against the preceding light-adaptation brightness. There is also a distinct tendency to faster adaptation time after exposure to lamp B throughout all levels of preceding light-exposure brightness. Several values at the highest brightness level are somewhat lower than might be expected from the trend of the increase before. This is probably due to the interference of blinking and lacrimation re-

speed of dark adaptation, the level of preadapting brightness within the range of from 100 to 1,050 M.F.C., the individual rate of increase did not appear to have any influence on the tendency to lower values after exposure with lamp B. Plotting of the average values of dark-adaptation time until recognition of 1 M.F.C. against preadapting brightness gave a picture very similar to figure 1 (10 M.F.C.) or figure 2 (0.05 M.F.C.); therefore, we refrain from publishing these data.

The transition point between cone and rod adaptation was also calculated for subjects ES and SB; in subject SS the dark-adaptation speed was so rapid that no definite transition point could be recognized, the same was true also in several experiments with ES and SB at the lowest brightness levels. After exposure

to lamp B there was a tendency of the transition point to occur earlier and at a lower threshold (as could be expected from the tendency of the average values in figures 1 and 2).

Owing to the considerable daily variations, the standard error of the average values could not be used to determine the statistical significance of the differences between lamps A and B. Two other procedures were possible: to calculate a) the significance of percentage variations (lamp B in percentage of lamp A) and

seen that the value 100 was attained only at the extreme range in subject SB, series II; in all other arrangements the extreme range was below 100, and so was the total average. This shows that the faster adaptation time after exposure to lamp B, which is about 15 percent, is statistically significant. This concerns, however, only the average values, and does not exclude overlapping of single experiments.

The frequency distribution of higher, lower, or equal values with lamp A or B was calculated in percentage of the to-

TABLE 2  
FREQUENCY DISTRIBUTION OF DIFFERENCE OF DARK ADAPTATION AFTER EXPOSURE TO LAMP A OR LAMP B

Subject	Expts.	Thresh- old M.F.C.	Percentage			Standard Error		Limits of Percentage Range of Faster Adaptation	
			Faster with Lamp B	Equal	Faster with Lamp A	Lamp		Lamp B	Lamp A
						B	A		
SS	22	10.0	77.3	9.1	13.6	8.93	7.31	50.1-100	0.0-35.5
	22	0.05	86.4	9.1	4.55	7.31	4.44	64.5-100	0.3-17.9
ES	20	10.0	90.0	10.0	0	6.71	0.5	69.9-100	0 -1.5
	20	0.05	90.0	10.0	0	6.71	0.5	69.9-100	0 -1.5
SB	22	10.0	86.4	13.6	0	7.31	0.45	64.5-100	0 -1.35
	22	0.05	90.9	4.55	4.55	6.13	4.44	72.5-100	0.3-17.9
Total	64	10.0	84.4	10.9	4.7	4.54	2.65	70.8- 98.0	0 -12.65
	64	0.05	89.1	7.8	3.1	3.90	2.17	77.4-100.0	0 - 9.6

b) the significance of the frequency distribution. Table 1 shows average and standard error of the dark-adaptation time of lamp B, in percentage of lamp A, at 0.05 M.F.C. The values were calculated from all experiments at all brightness levels for each subject. This is permissible, since the brightness level did not have a definite influence on the percentage difference between lamps A and B.

A range of the average plus or minus three times the standard error was calculated as probably a statistically significant range. If this range exceeds 100, the difference between lamp A and lamp B is statistically not significant. It can be

seen that the value 100 was attained only at the extreme range in subject SB, series II; in all other arrangements the extreme range was below 100, and so was the total average. This shows that the faster adaptation time after exposure to lamp B, which is about 15 percent, is statistically significant. This concerns, however, only the average values, and does not exclude overlapping of single experiments.

The standard error of this distribution was calculated according to Poll's<sup>25</sup> formula

$$E = \sqrt{\frac{P_1\% \times P_2\%}{N}}$$

where  $P_1 = 100 - P_2\%$  and  $N$  the number of experiments. Differences of percentage distribution between lamps A and B by more than three times the standard error might be regarded as statistically significant. In order to use the formula for zero values of A or B, a small but

definite percentage (0.1 percent) was arbitrarily accepted.

It can be seen (table 2) that in the great majority of experiments (between 77.3 and 90 percent of all values) the dark adaptation was faster after exposure to lamp B and only between 0 and 13.6 percent faster with lamp A.

The probable extreme limits of frequency distribution are above 50 percent with lamp B and well below 50 percent with lamp A. Calculated from the total of 64 experiments, not less than 70 percent of all values may be expected to have a faster rate with lamp B at 10 M.F.C. and 77.4 percent at 0.05 M.F.C., while not more than 12.65 and 9.6 percent, respectively, will show a faster adaptation rate after exposure to lamp A. This difference of distribution is statistically significant; it concerns the probability of reproduction in a small number of trained subjects. The distribution in a large number of subjects will be discussed in a later part of this paper.

In view of these results it is interesting to investigate whether any factor is changed except the speed of dark adaptation by the changed spectral distribution in lamp B. In former investigations, similarity of the contour of dark-adaptation curves was used as criterion. This method, however, is not applicable when the speed differences are large; the contour of rapid dark-adaptation curves differs from that of slower rates, as has been discussed in the introduction. We thought that a suitable approach could be to investigate the relationship of one part of the dark-adaptation curves to other parts of the curve. We plotted the dark-adaptation time of average and single values at 10 and at 1 M.F.C. against the dark-adaptation time at 0.05 M.F.C. Figure 3 shows the average values of SB. It can be seen that both values with lamp A and lamp B follow the same trend, although the val-

ues with lamp B are somewhat to the left, owing to the shorter adaptation time. The same can be seen if the average values of all three subjects are plotted together (fig. 4). The break of the trend between 250 and 350 'seconds' adaptation time at 0.05 M.F.C. (abscissa) is probably due to the fact that all values below 250 belonged to subject SS. This graphic analysis can be corroborated by calculation of the correlation coefficient between the adaptation time at 10 or 1 M.F.C. and that at 0.05 M.F.C. The correlation coefficient was calculated according to Spearman's formula. If single parts of the curve follow a different trend with lamp A and lamp B, it should be expected that the correlation coefficient is substantially lower when calculated from the total of all experiments with lamp A and lamp B together, compared to the values obtained from the series with either lamp alone. Table 3 shows that the correlation coefficient was very high with each, lamp A or lamp B, and was not essentially changed when both series are taken together. This shows that probably no other factor is changed except the rate.

Table 4 shows the average time of dark adaptation of 32 subjects, each investigated two or three times, with lamp A, lamp B, lamp B in percentage of lamp A (lamp A being taken as 100), and standard error (SE) of the percentage. The average values with lamp B are lower than those with lamp A at threshold 10, 1, and 0.05 M.F.C., the average percentage being 75, 70, and 74, respectively. The difference at 10 M.F.C. is statistically not significant, owing to large individual variations, as indicated by the high standard error. However, the difference at 1 and 0.05 M.F.C. is statistically significant. This procedure to prove statistical significance was chosen because the wide range of individual dark adaptation would

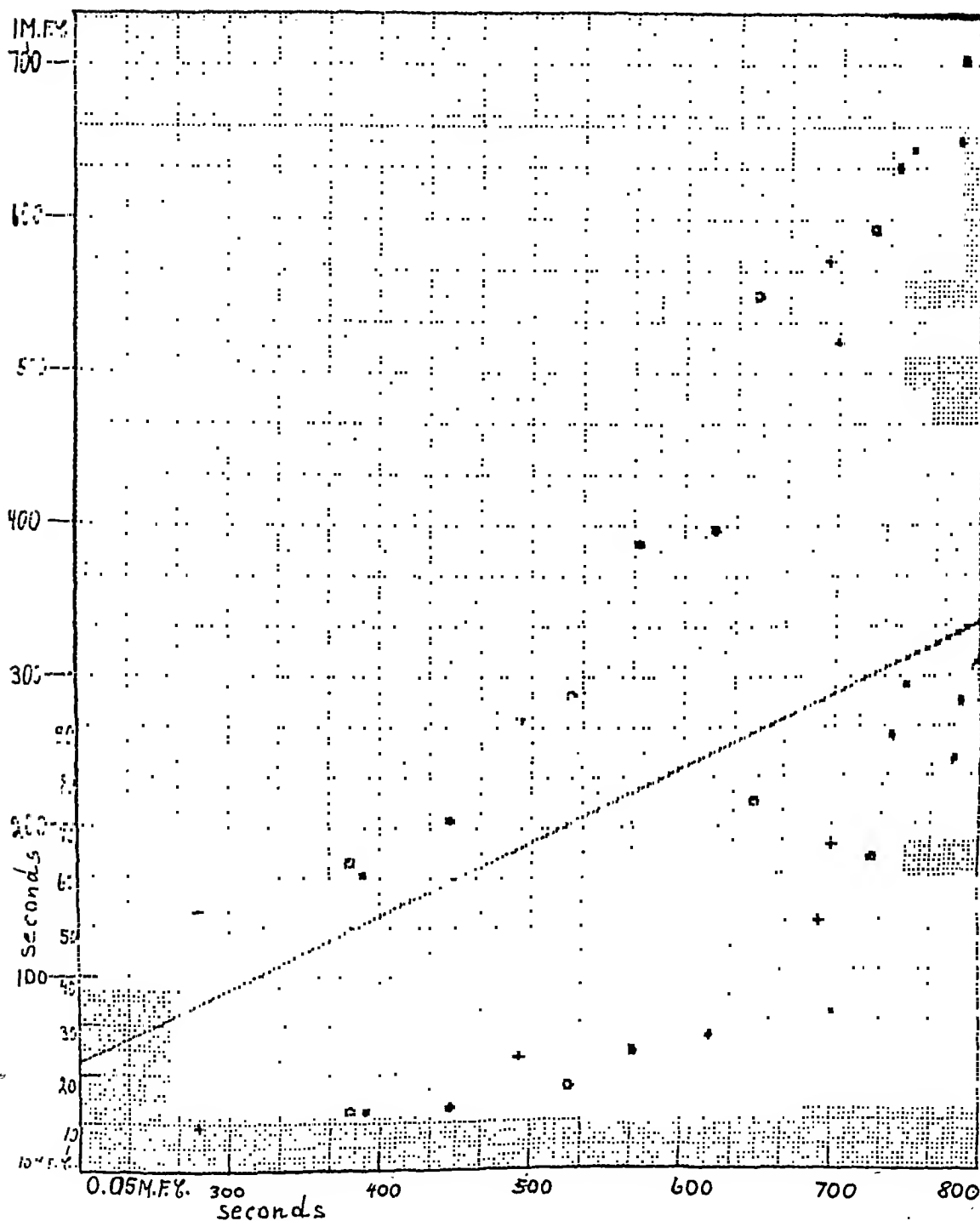


Fig. 3 (Simonson et al.). Relationship between dark-adaptation time at 10 M.F.C. (lower part, ordinate), 1 M.F.C. (upper part, ordinate), and at 0.05 M.F.C. (abscissa) in subject SB, Lamp A, series I, ●; lamp A, series II, +; lamp B, O.

statistically overshadow the absolute difference between lamps A and B. Another procedure is to take groups of individuals with comparatively small differences. This subdivision was made according to the values with lamp A at 0.05 M.F.C.

The individual variation was less pronounced near the average than in the extremely slow or fast groups. There were 10 subjects between 248 and 320 seconds (total adaptation time) with lamp A with an average of 275 seconds.

The corresponding average of this group with lamp B was 209 seconds. The difference (70 sec.) can be regarded as significant when exceeding the expression

$$2\sqrt{SE_1^2 + SE_2^2}.$$

The value of the expression was 8.46, so that the difference is highly significant.

0.05 M.F.C., where out of 73 determinations in 32 subjects, 62 (85 percent) showed faster dark adaptation with lamp B, with equal or faster values with lamp A in the remaining 11 experiments. From the standard error it was calculated that the lower probable range of faster values with lamp B was about 72.5 percent. At

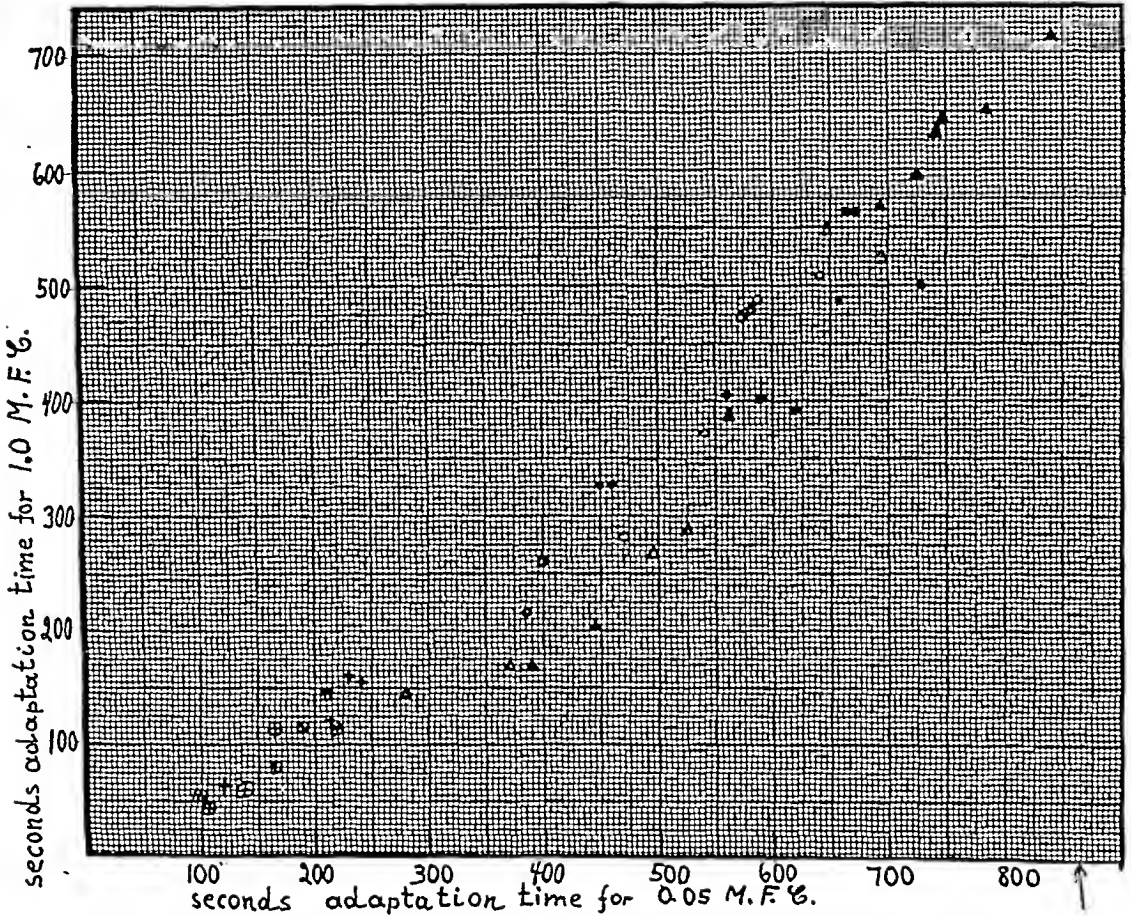


Fig. 4 (Simonson et al.). Relationship between dark-adaptation time until recognition of 1 M.F.C. (ordinate) and recognition of 0.05 M.F.C. (abscissa). Average values of three subjects: SS—lamp A, + ; lamp B, ⊕ ; ES—lamp A, ● , lamp B, ○ ; SB—lamp A, ▲ , lamp B, △ .

The same calculation was made with a consecutive group of eight subjects with values (with lamp A) between 360 and 403 seconds and an average of 380 seconds, the average of this group with lamp B being 278; the difference (102 sec.) exceeded the expression (55.42) and was statistically significant.

Statistically significant also was the frequency distribution of values at 1 and

0.05 M.F.C., 23 out of 32 subjects had a faster adaptation with lamp B in two experiments performed on two different days. In the other nine subjects, three experiments were performed which showed faster values after exposure to lamp B in two experiments in seven subjects, and in only one experiment in two subjects. Although the great majority of determinations showed a faster speed

TABLE 3  
CORRELATION-COEFFICIENTS BETWEEN DURATION OF DARK ADAPTATION UNTIL RECOGNITION OF  
10 M.F.C., 1 M.F.C. AND 0.05 M.F.C.

Subject	No. of Expts.	Lamp	Correlation Between	Coefficients
ES	20	A	10 M.F.C.-0.05	0.916
	20	B	10 M.F.C.-0.05	0.907
	40	A & B	10 M.F.C.-0.05	0.907
SB	21	A	10 M.F.C.-0.05	0.972
	21	B	10 M.F.C.-0.05	0.934
	42	A & B	10 M.F.C.-0.05	0.946
SS	12	A	10 M.F.C.-0.05	0.575
	22	B	10 M.F.C.-0.05	0.683
	34	A & B	10 M.F.C.-0.05	0.728
ES	20	A	1 M.F.C.-0.05	0.889
	20	B	1 M.F.C.-0.05	0.905
	20	A & B	1 M.F.C.-0.05	0.901
SB	21	A	1 M.F.C.-0.05	0.970
	21	B	1 M.F.C.-0.05	0.961
	42	A & B	1 M.F.C.-0.05	0.962
SS	12	A	1 M.F.C.-0.05	0.922
	22	B	1 M.F.C.-0.05	0.906
	34	A & B	1 M.F.C.-0.05	0.920
Average 3 Subjects	20	A	10 M.F.C.-0.05	0.860
	24	B	10 M.F.C.-0.05	0.805
	44	A & B	10 M.F.C.-0.05	0.828
Average 3 Subjects	20	A	1 M.F.C.-0.05	0.978
	24	B	1 M.F.C.-0.05	0.988
	44	A & B	1 M.F.C.-0.05	0.976

with lamp B, occasionally exceptions were observed, as is shown also in the series with trained observers. This series proves that the results with three trained observers are in line with those obtained on 32 untrained observers. Although the latter were investigated with only one brightness level, a generalization to other brightness levels appears to be possible. On the other hand, there is a discrepancy in the results at 10 M.F.C. Out of 73

experiments, 42, or 57.5 percent, showed a faster dark adaptation with lamp B. This percentage distribution is statistically not significant. The discrepancy might be due to the fact that the first values are the least accurate ones. On the other hand, it is possible that the immediate aftereffect of glare in untrained observers is the same in lamps A and B, and that the advantage of lamp B appears as dark adaptation proceeds.

The 32 subjects were subdivided into four groups each of eight subjects according to the individual dark-adaptation speed with lamp A. Table 5 shows the average values and the percentage of lamp B, lamp A taken as 100. It can be seen that the percentage was about the same in all groups. This demonstrates that the difference between lamp A and

TABLE 4  
AVERAGE ADAPTATION TIME FOR 32 SUBJECTS

Thresh- old M.F.C.	Adaptation Time (Sec.)		Lamp B in per- cent of A	SE	Signifi- cant
	Lamp A	Lamp B			
10.0	16	12	75.0	6.736	No
1.0	156	105	69.8	0.531	Yes
0.05	323	239	74.0	0.431	Yes

lamp B does not depend on the individual rate of adaptation.

#### COMMENT

The results show a statistically significant faster dark-adaptation speed in a lamp (B) whose spectral range has an appreciable reduction of the radiation at both ends of the visible spectrum. This difference probably does not depend on the level of preadaptation of brightness exposure, on daily variations, and on individual variations. A certain influence of training is present in the first reading (10 M.F.C.) after brightness exposure, in that significant differences between lamps A and B are obtained only in trained observers at this level. The results are compatible with Mandelbaum and Mintz's observations. They measured the cone dark-adaptation speed in different parts of the spectrum, using violet, blue-green, green, yellow, orange, and red test lights, after exposure to violet, green, and red light. Exposure to red light decreased significantly the dark adaptation in the red part of the spectrum (about 37 percent) and exposure to violet light slowed down the adaptation to the violet test light (15 to 20 percent) whereas in the medium part of the spectrum the dark-adaptation time was about the same after exposure to violet, green, or red light. Thus, if the extreme parts of the visible spectrum are reduced as is the case in illuminant B, it is conceivable that the adaptation rate is faster by elimination of those parts of the total adaptation curve which are slowed down by the action of the extreme parts present in the usual white light. While Mandelbaum and Mintz consider only retinal factors, the role of the central nervous system in dark adaptation is being widely discussed. The fact that illuminant B changes only the rate of dark adaptation without any other essential change of the

curves cannot be used to support either assumption. The results are consistent with our finding of a more rapid increase of the fusion frequency of flicker with increasing brightness with illuminant B, which was interpreted as probably due to a diminished glare effect, but it is most

TABLE 5

AVERAGE DARK ADAPTATION TIME AT 0.01 M.F.C. OF FOUR GROUPS OF EIGHT SUBJECTS GROUPED ACCORDING TO INCREASING DURATION OF DARK ADAPTATION.

Group	Average (Sec.)		Percentage
	Lamp A	Lamp B	
I	163	119	73.3
II	277	212	76.8
III	369	281	76.2
IV	483	343	71.1

likely that different factors are involved in dark adaptation and flicker phenomenon. Our results on dark adaptation cannot be transferred to the glare effect on other visual functions, such as visibility or surrounding halos, although there might be some relationship to the recovery of visibility after glare. For a complex evaluation of the glare effect of different illuminants different visual functions should be considered, the practical importance and applicability of which would obviously vary with the situations and conditions in which the illuminants are used. The usefulness of dark-adaptation tests in a comparative study has been demonstrated in the present investigation and it appears that the rate of exhaustion and recovery of photo-sensitive substances is so fundamental a process that it should not be neglected in the appraisal of the complex glare effect.

#### SUMMARY

In three trained subjects the cone dark adaptation proceeded faster after exposure to an illuminant (B) whose spectral range had a reduction at both ends of the visible spectrum as compared to the



usual frosted lamps (A). The difference was not significantly influenced by four levels of preadaptation brightness, by daily variations, and by individual variations. Evidence is presented that only the speed of dark adaptation is changed, without essential change of the contour of the curves. In a significant majority of 32 untrained subjects the cone dark adaptation was faster after exposure to

lamp B, except the first readings at 10 M.F.C., where no significant difference between lamp A and lamp B was observed. The difference of dark adaptation between lamp A and lamp B was about the same in four groups of eight subjects, grouped according to the individual dark-adaptation speed. The usefulness of dark-adaptation experiments for the appraisal of the glare effect is discussed.

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# BINOCULAR AND RED-FREE OPHTHALMOLOGY\*

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The ophthalmoscopist should regard the choriocapillaris, lamina of Bruch, and the pigment layer of the retina as a single tissue that returns light to the examiner's eye. The rays are tinged a beautiful red by the blood in the choroidal vessels, and the small amount of light reflected by the retina is completely smothered. By changing the light, the choroidal component of the fundus picture may be reduced and the retinal element augmented until retinal details can be studied.

Jackson's use of sunlight for ophthalmoscopy was one of the early successful efforts to this end. An idea of his results can be gained by using strong white light in the eye of a young blonde with widely dilated pupil. About 1900, Affolter, Vogt, Lauber, Gullstrand, Holm, and others began experiments to make retinal details visible by filtering out objectionable rays from various kinds of light. Heine used green light, but the final practical program was worked out by Vogt and Affolter, using an arc light as the source and a filter of a 30-percent copper sulfate solution with 1 percent eiro-viridin blue. Early efforts were concentrated upon eliminating red rays, but it was found desirable to reduce the yellow component because it made the normal red fundus appear much darker. The hotter the source of light is made, the less red and yellow and the more green and blue rays are obtained. With the light source at 1,000° C., 55 percent of the output is red, 20 percent is yellow, and green is rated at 25 percent, but no blue is found. If an arc light is used, the temperature is raised to 3,500°

C., whereupon red drops to about 15 percent, yellow falls even lower, while green rises to 60 percent, and blue is credited with 5 percent. The temperature of the sun is 6,000° C., which explains the red and yellow content of sunlight at 15 percent and 10 percent, respectively, with green up to 65 percent and blue at 10 percent. If red and some of the yellow are eliminated by filtering to permit the retinal image to appear, the loss at lower temperatures is so great that we cannot get results with any source short of the arc light. The No. 64 Wratten filter put out by the Eastman Kodak Company is one of the most successful for this purpose, but transmits only 27 percent of the light used. This explains why mercury-vapor light, nitra lamps, and the very best of our hand ophthalmoscopes cannot give a satisfactory fundus picture with the desired retinal details.

Dry filters have not produced satisfactory results for me, but the filtering tank cannot have an inside diameter of more than 10 mm. or the loss will impair the brightness of the image. If the macula appears as a rich yellow area with clear foveal reflex and papillomacular fibers can be made out as they arch from the disc to the macular area, we are sure to have a satisfactory red-free light. There is no agreement as to the source and significance of the yellow color of the macula. Vogt attributes it largely to selective absorption of light by the pigment epithelium and reduced coloring by the choroidal blood. As the area of this colored zone in red-free light coincides with that seen in the human retina removed immediately after death and the ophthalmoscopic picture is constant, we can ac-

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cept it as a standard without discussion. The pupil must be dilated and the eye able to withstand strong light. Vitreous haze prevents its use, and it is a supplement to our very effective hand scopes but never replaces it. The old-fashioned hand ophthalmoscope is used according to the direct method, and I have never seen any bad results from this set-up. There have been no important additions to the literature of this subject for the past decade.

What are the details seen with red-free light, and do the advantages justify the time and trouble necessary?

As a rule, choroidal defects become less evident, and retinal details invisible in white light can be seen. The illustration of Vogt's slitlamp atlas are marvels of accuracy in detail and color, but the illustrations of red-free-light fundi in the published articles are beyond anything I have seen. I have not seen the changes in the papillomacular bundle in simple and retrobulbar neuritis, nasal sinusitis, the amotio retinae of trauma, and multiple sclerosis claimed for this method. One of Vogt's triumphs is his study of the macula in albinism and the demonstration that the appearance of the macula in red-free light corresponds with the central acuity in the case.

Most of the important fundus lesions begin in the choroid and involve the retina later. In the past, we have been satisfied to assume that early retinal changes existed when vision was reduced. In many cases of this type it is possible to see the retinal changes in the macula in the very early stages. On the minute macular vessels one can also see the fine varicosities which precede hemorrhage.

Hereditary macular degeneration may show an imposing mass of white spots in and about the macula, with vision at 20/20. In some of these cases the number of additional white spots made visible by the red-free light is amazing. In striking

contrast, another case may begin with minute macular pigment and rapidly fading vision. At times, it becomes an important question whether a macular defect is congenital or progressive. In each type, red-free light will explain the apparent contradictions. In the fundus of an eye with pigmentary retinitis, pigment clumps, not visible in white light, may be seen beneath a film that is probably gliosis of the retina, which is a part of the disease and occasions the diagnosis of choroideremia and retinitis pigmentosa sine pigmenta. Inherited syphilis is often accompanied by marked peripheral pigment changes which gradually fade. This may be followed by "watered-silk effect" in the macula and progressive loss of vision. The changes in the macula itself can be made out at a time when white light will show nothing but high reflexes.

The original binocular ophthalmoscope was bulky, difficult to keep in adjustment and not easy to operate. It never came into general use, but both Zeiss and Bausch and Lomb have put out simpler and more effective models well worth while. The image is about twice the size of the hand scope, reducing the area of the available field. Very little vitreous haze prevents its effective use; the pupil must be wide and the eye able to tolerate the amount of light necessary. This instrument permits an appreciation of the third dimension giving an image of the retina as a delicate film, just short of transparency, standing out in advance of the red fundus background. In this retinal film ramify the retinal vessels, and it is easy to locate a lesion in the retina or in the fundus behind it. A diagnosis of swelling of the disc can be made by observing the course of the vessel stalks as they emerge from the disc. What may seem to be a solid mass in the fundus when viewed through the hand scope may be resolved into a lesion of the fundus background, with

an optically empty material pushing the retina forward in front of it. The ability to look into a congenital cyst of the optic disc must be experienced to be appreciated. What may look to be bare sclera with the hand scope may be an organized exudate projecting into the vitreous. The ectasias of extrapapillary colobomas stand out boldly. Angioid stripes look like blood vessels to the monocular observer, but the binocular scope flattens them out to streaks of pigment granules continuous

light is cheap. Both must be ready for instant use to get results. They can never take the place of the present hand scope, which is the most effective instrument we have. A series of kodachromes of fundus paintings made with the help of the binocular scope will be shown to make the meaning clearer. I have no red-free fundus pictures of my own, because direct ophthalmoscopy is too difficult and we cannot subject the patient to prolonged exposure to this strong light. Here is the

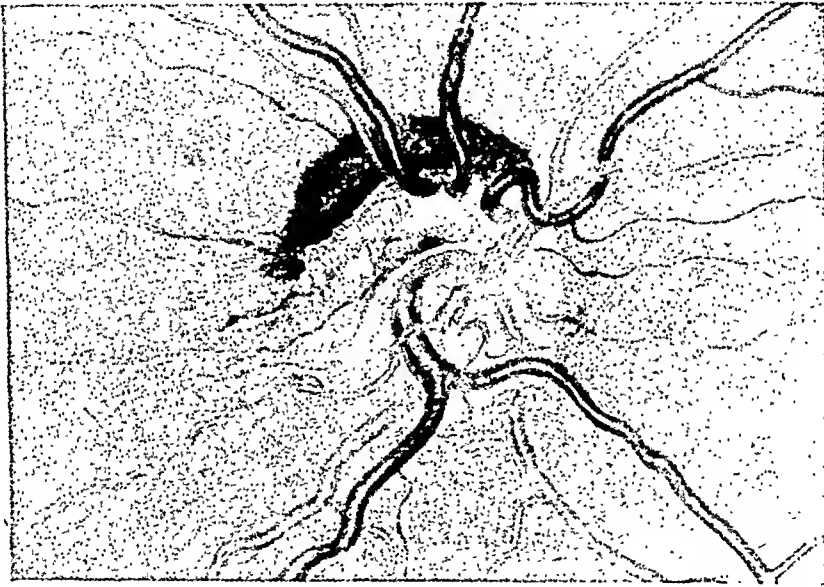


Fig. 1 (Lloyd). Partial avulsion of the optic nerve. Painted from observation through the binocular ophthalmoscope.

with the pigmented fundus background around the optic disc.

Some success has been attained by placing a dry filter in the lighting system and stepping up the current to produce red-free light. It is not so good as the arc light and liquid filter but is very satisfactory and easy to handle. The binocular scope is a great help to the artist making fundus sketches. Neither of these instruments is indispensable, and the oculist can discharge his full responsibility to his patient without them. The binocular scope is expensive, but the apparatus for red-free

ideal place for the binocular ophthalmoscope with proper filters and an arrangement to step up the amperage to compensate for the removal of red and some of the yellow rays.

It was not possible to reproduce the illustrations used when the paper was presented, but a few will be shown here to indicate some of the advantages of both red-free light and binocular ophthalmoscopy.

The finest illustration of the penetrating power of binocular ophthalmoscopy will be seen if the reader will look in volume

22, of the American Journal of Ophthalmology, page 760. There is an illustration of a "prepapillary congenital cyst con-

of the optic nerve. During a game of basketball, the patient's eye was inadvertently jabbed by an opponent's

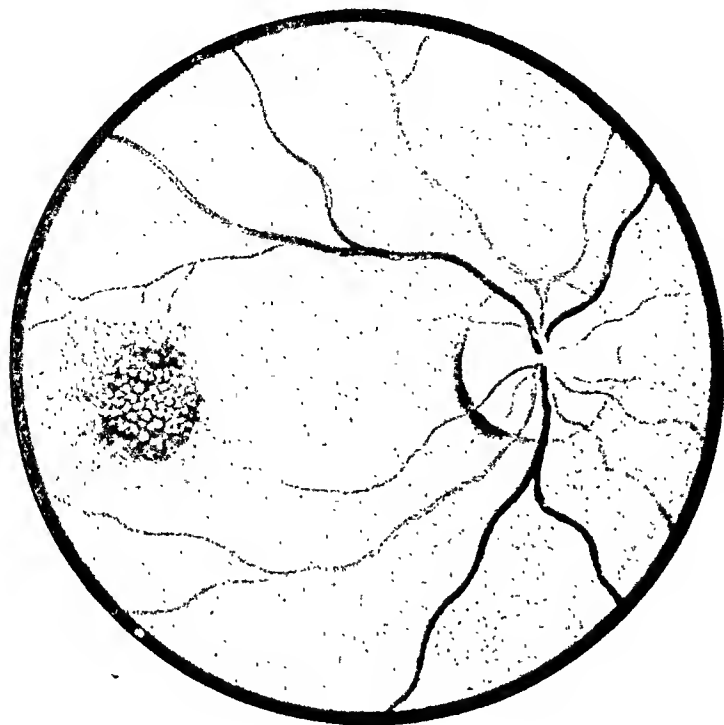


Fig. 2 (Lloyd). Senile type of hereditary macular degeneration with normal vision.

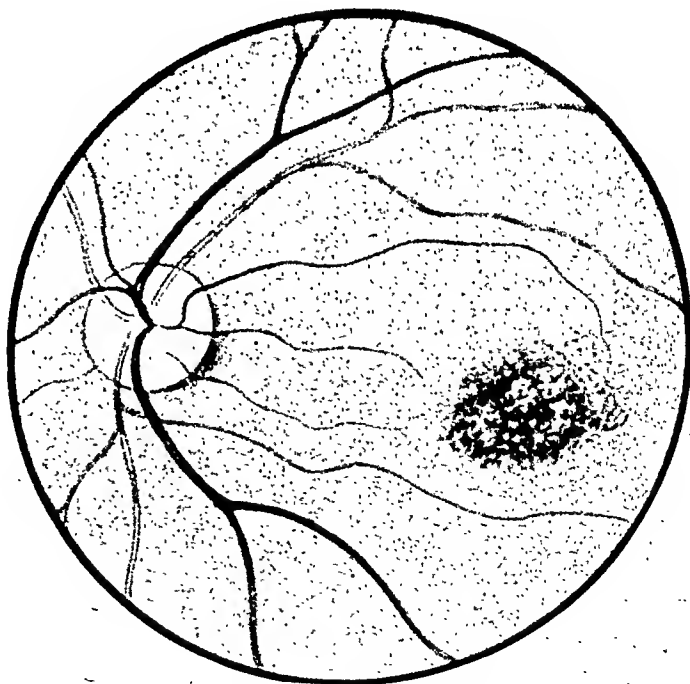


Fig. 3 (Lloyd). Serious type of hereditary macular degeneration with vision of 10/50 and 10/70.

taining a moving vascular loop." The article is by Dr. Levitt and myself. Figure 1 of this article shows the torn and retracted fibers of a case of partial avulsion

finger, producing a severe vitreous hemorrhage and total loss of vision for a time. The blood was absorbed, and although the patient has 20/20 vision the entire

lower half of the field was lost and the eye is of little use. The tear is plainly seen, and the wrinkling of the retina about the disc is evidence of the severity of the damage. The binocular scope showed the torn nerve fibers very clearly, and the details were much more clearly seen than with the hand scope, although the diagnosis should be made with its use alone. Figures 2 and 3 are cases of senile macular change and types of hereditary macular degeneration. Figure 2 shows the fundus of a man in his 60's, with an acuity of 20/20. The spots are of the type seen frequently with good vision at least early in the case. Only one case of this type has been examined under the microscope, and the changes were located in the lamina of Bruch. The spots are frequently seen in younger people and have been called "guttate choroiditis" and "honey-comb choroiditis." The macula retains its normal

yellow-brown color in these cases until pigment changes set in, whereupon the vision drops. Figure 3 is the fundus of a man aged 39 years who stated that his vision had been failing for the past year or so. When viewed with white light, a watered-silk sheen was observed over the macular area which could be changed by shifting the angle or position of the scope. The visual acuity was down to 10/50 and 10/70, which was out of all proportion to the amount of change seen. Using red-free light, one could see a delicate lace work of gauzy nature in the retina; the normal yellow brown of the macula was almost gone.

This picture was painted from observation, the artist using a binocular ophthalmoscope. The "ghost" is omitted to permit the details to appear.

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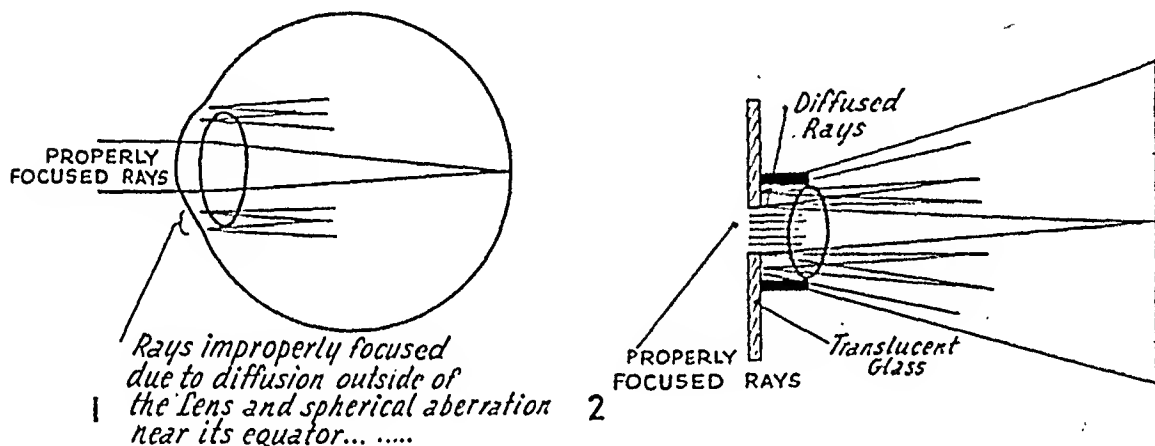
# THE CAUSE AND TREATMENT OF POOR VISION IN ANIRIDIA

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Aniridia is a congenital lack of iris, hereditary in nature, almost always bilateral, occurring as a dominant characteristic. The most obvious signs of the condition are photophobia, contraction of the palpebral fissure, evidence of difficulty in focusing, and the general appearance of an unusually large pupil.

This paper will deal with the cause of the poor vision usually found in uncon-

The present writer believes that if the pathologic change occurring in aniridia were explained to any one versed in the science of photography, another cause of the poor vision would immediately occur to him; namely, the aberration of the light entering the eye in the region both outside and insight the equator of the lens. According to Friede,<sup>3</sup> Ishikawa was the first to advance this theory as to the



Figs. 1 and 2 (Alger). Schematic drawings to show light entering: Fig. 1, the eye in a case of aniridia. Fig. 2, the camera with a piece of perforated ground glass in front of the lens.

plicated cases of aniridia and describe a treatment which has been used very successfully.

Berens<sup>1</sup> explains the poor vision in cases of aniridia as follows: "The reduction in vision is due to an aplasia of the fovea centralis, a defect which has been found on histologic examination and which may also account for the photophobia present."

Duke-Elder<sup>2</sup> states that "in the absence of other anomalies, the frequent occurrence of poor visual acuity may be accounted for by the fact that in several cases, clinical examination has shown that the fovea is absent."

cause of poor vision in aniridia.

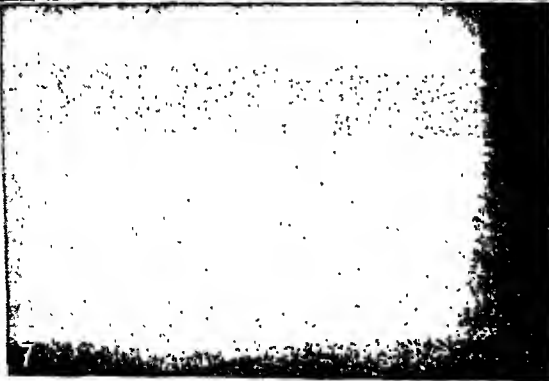
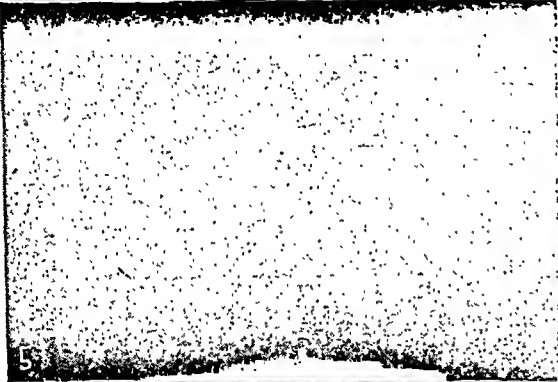
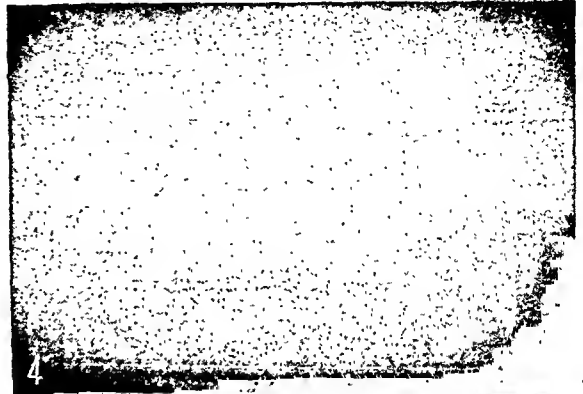
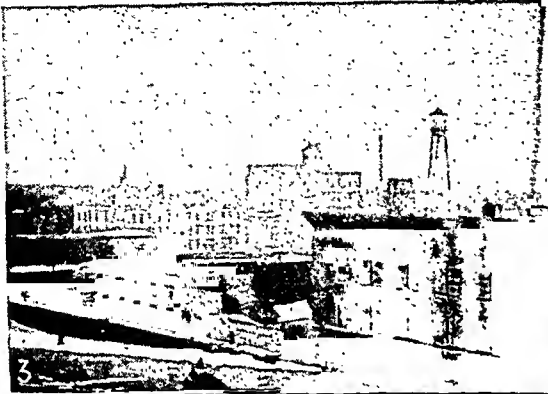
In order to illustrate this aberration, the present writer has devised certain experiments which are designed to show: 1. The aberration of light in cases of aniridia when the eye is wide open. 2. The aberration of light in cases of aniridia when the lids are "squinted" partly shut. 3. The added aberration when the light is shining directly upon the lids and the eyeball of an eye under the two foregoing circumstances.

To illustrate this, a hole was drilled in a piece of ground glass, representing light entering a camera in a diffused fashion, as compared to light similarly entering the

eye in a case of aniridia. Figure 1 represents the eye in a case of aniridia.

Figure 2 represents a camera with a piece of perforated ground glass in front of the lens. The dispersion of light com-

through the edge of the lens tends to be deflected toward the foveal region. When the subject is looking in the direction of a bright light, such dispersion would cause a greater blurring than



Figs. 3-7 (Algier). Fig. 3, Taken with a standard camera. Fig. 4, Same view taken with the ground glass and the opening in front of the lens, to represent the amount of clearness experienced in the average case of aniridia. Fig. 5, Same view taken with the ground glass in place while the sun is shining directly upon it. This would represent the amount of dispersion of light when the latter was striking the eyeball. Fig. 6, Taken with the ground glass and the "pork-rind lids" "squinted" together. Fig. 7. Taken with the sun shining directly upon the lids." (White streaks are artifacts.)

ing through the ground glass would about equal that at the edge of the lens in a case of aniridia, but with this distinct difference; namely, the translucent glass would disseminate the light evenly over the film, causing a general cloudiness of the picture. In a case of aniridia, however, the dispersion of light passing

would the ground glass in the case of the camera. This partly accounts for the added discomfort experienced in a case of aniridia when the subject looks toward a window or bright light. In order to represent the effect of the lids, a piece of pork rind was cut with a slit to represent as nearly as possible the correct



width of the lids when a patient is "squinting" his lids together. Then, with the same exposure and the same opening in the shutter, the following photographs were taken, as shown in figures 3 to 7.

These illustrations represent approximately the present writer's conception of the various degrees of light dispersion to which a person with a case of aniridia is subjected. It would seem that the aberration of light is at least an extremely important, if not the only, cause of the poor vision and the photophobia in uncomplicated cases of aniridia and albinism.

As opposed to the theory that the cause of the poor vision is due to lack of a fovea centralis is the fact that the latter does not develop fully until 16 weeks after birth. Just what causes it to develop after birth is not known, but it is probably due to the light striking it and stimulating it, simultaneously along with the nerve stimulation that is carried to the brain. In the case of aniridia and of albinism, the light is not concentrated at the macula in a clear pattern of an image and the stimulation of the macula does not take place as it would in ordinary eyes. Consequently, the macula would not have a tendency to form in a normal fashion.

In support of this theory, reference is made to the interesting case reported by Friedman,<sup>4</sup> in which the macula was destroyed at birth and the adjacent retinal tissue developed into a macula. While Friedman offers another explanation for the development of the false macula, he offers no proof of his theory and, therefore, his case adds to the weight of the argument here advanced.

Several investigators have tattooed the corneas of albinos, others have prescribed peripherally opaque contact glasses in cases of aniridia and of albinism. A great

improvement in vision and a loss of the photophobia have resulted. These results further substantiate the "diffusion theory" of poor vision in cases of aniridia and of albinism.

The question arises: If the aberration of light is the cause of the poor vision, then why should patients in a few cases of aniridia have 20/20 vision? Aniridia is not a definite entity, but varies from only a small loss to a nearly complete loss of the iris. Perhaps the variable vision may be explained on the basis of the variable amount of residual iris. If this has been worked out clinically, it is not known to the writer but it would seem to be a logical premise upon which to base conclusions.

If the foregoing concept as to the cause of poor vision is correct, it would seem that the treatment would be to render opaque the outer portion of the cornea in cases of aniridia, and to render opaque not only the periphery of the cornea but as much of the anterior sclera as possible in cases of albinism. Furthermore, to be successful the operation should be performed while the eye is in its developmental stage; that is, within the first three years of the child's life.

The writer has been unable to find in the literature any case in which this method of treatment has been applied in cases of aniridia. Two surgical texts mention it as a treatment: Spaeth<sup>5</sup> recommends the treatment in his book on ophthalmic surgery and Wiener, and Alvis<sup>6</sup> condemn the treatment. In neither volume is any reason offered for the opinions given nor have the authors been able to supply the writer with case reports. However, the method has been used in cases of albinism with reasonable success. Kreiker<sup>7</sup> attempted to tattoo the inner surface of the lids but failed because of sloughing. Friede<sup>8</sup> discussed the

theories of Fritsch, Elschmig, and Ishikawa, their theories being, respectively, that poor vision is due to a lack of a fovea, to a high refractive error, and to a diffusion of light. He states that although there is much in the literature as to the cause of the condition, there is, unfortunately, practically nothing on therapy. He first tried injections of India ink in the fornix and subconjunctivally. This produced a distinct and marked clinical improvement, but the cosmetic effect was that the lids and conjunctiva were darkened and made unsightly. He next opened Tenon's capsule above and below and with a spatula inserted a thick paste of India ink. This gave a very good result clinically and without quite such poor cosmetic results. However, Friede admits that in both cases the black conjunctiva had an unsightly appearance. He corrected it, however, to a large extent by a surgical narrowing of the lids. This alone, he finds, is not enough. There remains the darkening of the periphery of the cornea.

Friede reviews the literature of his time on this subject, citing Komoto, Galtier, and Wilson. Komoto gave up with one attempt, stating that the undertaking was too difficult. Wilson, however, tattooed the cornea with unusually gratifying results as to the photophobia. Friede also reviews the possibilities of using paraffin impregnated with India ink in the unexposed portions of the sclera, warning that the danger of paraffinoma is not to be disregarded. Two years later the same author<sup>3a</sup> gives a further report: "Das Problem der operativen Verbesserung der Sehleistung des gänzlich albinotischen Auges, zugleich Kritik der Goldfärbung der Bindehaut nach Knapp." He here reviews his own endeavors previously to darken the sclera; also his attempted use of contact glasses with an

opaque periphery, mentioning not only their helpfulness but also their many disadvantages. He suggests that the cornea should preferably be tattooed with India ink since he disapproves of the deep opacity that the gold chloride forms.

A report by Reid<sup>8</sup> is also of interest. He presents a case of aniridia, in a salesman, aged 28 years. Vision was 6/12 and the patient had intense photophobia when exposed to a "bright room or diffuse daylight." Reid fitted him with contact glasses, obtained 6/6 vision, and eliminated the photophobia.

For many years the present writer has wished for an opportunity to try tattooing the cornea in a case of aniridia. Three years ago such an opportunity presented itself. The case report follows:

On July 11, 1941, S. H., a female aged 20 months, was brought for examination. The child showed a marked tendency to avoid light from the windows of the office. Her eyes were rather difficult to examine because of her dislike for the light of a flashlight or ophthalmoscope. A typical aniridia was found, with the edge of the lens clearly visible throughout the entire equator. There was no nystagmus. No fovea could be seen, but it was not possible at the time to make a thorough examination of the fundus.

The parents of the child had taken her to other ophthalmologists who had given her opaque "glasses" with multiple holes. These the child would not wear. She did seem to do better, however, with tinted lenses which the parents had given her. The condition was explained to the parents and the treatment of tattooing the cornea was suggested to them. They were willing to try it.

Since Friede had shown a preference for India ink as compared to gold chloride, I decided to try it. The tension was

taken at the time of the operation and found to be 20 mm. Hg (Schloetz). Only the lateral and medial portions of the cornea of the left eye were tattooed. The eye healed in about one week; then the same treatment was performed on the right eye, which also healed in about one week.

The parents returned two weeks later and said that the child would now stand and look out of the window for the first time. They were positive that she was distinctly better. Since the coloring was by no means complete, the tattooing of the right eye was repeated. The parents were not well-to-do, and the child was allowed to go home before the cornea was healed. This was a mistake. A severe ulceration took place in the right eye and extended past the center of the cornea by the time she was returned for treatment. She was hospitalized, a delimiting keratotomy performed, and the ulcer cauterized. It healed, but half of the cornea was badly scarred.

The parents were not discouraged, however, and wanted the second tattooing performed on the left eye. This time platinum chloride was applied to a small area, experimentally. The eye healed uneventfully, and so the lateral and medial portions of the cornea of the left eye were tattooed two weeks later. Subsequently the same procedure was used on the right eye. The tattooing extended fairly well around the cornea, but it was thought best not to encircle the cornea completely for fear of interfering with its nourishment.

In three weeks' time photophobia in the left eye had completely disappeared. The child could easily find a penny thrown 15 feet from her. Photophobia continued in the right eye for four or five months, probably attributable to the cause of photophobia in the original aniridia; namely, the blurring of the light. (Duke-Elder<sup>2</sup>

mentions this annoying effect of scar tissue.) As the cornea cleared, the photophobia of the right eye disappeared, as was evidenced by the fact that the patient no longer kept the right eye closed.

The last time that she was seen in the office in May, 1943 (two years after the operation), her vision was about 20/20 in the left eye; in the right eye it was almost as good. She could play outside with other children and had no photophobia.

### CONCLUSIONS

Probably nothing definitely new as to the cause or treatment of poor vision in aniridia has been presented. The subject is discussed in the hope of dispelling the now prevalent defeatist attitude toward the treatment of this condition. Moreover, this treatment seems to have been very rarely attempted and thus this case should be worth reporting.

The results obtained tend to disprove the theory advanced by Berens and Duke-Elder that the photophobia is due to the lack of a fovea centralis. The photophobia was so definitely noticeable before surgery and so entirely lacking after surgery that in this case, at least, it must have been caused by the aberration and dispersion of light passing through the periphery of the cornea.

No information is available as to whether the patient in this case had an undeveloped fovea when first treated. The child was too young and too apprehensive to allow of a good fundus examination while she was awake; unfortunately no written note of the fundus findings was made when she was under anesthesia. Although the fundus was examined with an ophthalmoscope while the child was anesthetized, the chief concern was to ascertain the amount of pigmentation on the cornea, and the fovea was not given much attention at the time.

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## ANISEIKONIA AND SPATIAL ORIENTATION\*

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## INTRODUCTION

The various types of sensory and conceptual visual data by which man perceives the location of objects in space and the orientation of those objects relative to his own body may be divided into the uniocular and binocular categories. The uniocular data are derived from vision in one eye alone, whereas the binocular data can arise only from simultaneous perception of stimuli reaching the two eyes.

A person who has been one-eyed for some time usually localizes objects with considerable accuracy and is able to perform fairly fine tasks involving visuo-manual coordination. He obviously must rely upon the uniocular data for his orientation in space. The more important of these uniocular factors may be listed as follows:<sup>1</sup> parallax, which is associated with head and eye movements; the overlay of the nearer objects upon the more distant; the size and shape of known objects; linear perspective; clearer delineation and finer detail associated with near objects; arrangement of areas of light and shadow; increased brightness associated

with nearer objects; coolness and warmth of color associated with far and near; vertical position, in which the higher is the more distant, and other factors. These uniocular factors are also constantly operative in binocular vision, substantiating or correcting the spatial localization derived from the binocular data.

The outstanding fact of binocular spatial depth localization is the phenomenon of depth perception, which arises from the disparities between images on the two retinas (stereopsis). These disparities are due to the fact that the two eyes are separated in space. Objects located at different distances in the field of view are imaged differently in the two eyes and are, in general, imaged on so-called disparate elements of the two retinas. When sensory fusion or near-fusion of these retinal images occurs, the singular quality of a third dimension is directly perceived. Stereopsis is not restricted to the central parts of the field of vision, but exists for objects in the entire binocular field of view.

In studying the act of vision, the fundamental difference between the uniocu-

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lar and binocular clues to depth perception must always be kept in mind, but it must also be understood that man's unerring orientation in space is made possible only by the constant interaction of both sets of clues\*

The information derived from the disparity clues alone may, under certain conditions, not agree with the prior knowledge of the objects viewed. In these circumstances the monocular clues will modify and rectify the incorrect information obtained from the disparity clues and may completely dominate them or lead to their suppression. Such a condition occurs, for example, when differences in the size of the images of the two eyes are introduced, by placing a meridional size lens† in front of one eye.

In normal binocular vision the stereoscopic localization and orientation of objects in space are substantially correct; that is, they are in accord with the actual positions of the objects seen.‡ But if differences are introduced in the relative size of the retinal images, for example by size lenses, all the disparities between the two eyes will be changed and the objects in space will appear incorrectly localized and oriented with respect to each other. This

was one of the important facts brought out in the early work on aniseikonia by A. Ames, Jr., and his collaborators.<sup>4</sup>

However, the incorrect orientation of objects produced by size lenses is more noticeable in some environments than in others. In 1935, Ames stated the essential facts of the problem from evidence obtained in studying aniseikonic patients on the so-called tilting board; namely, that subjects with aniseikonia do have an incorrect binocular space perception, but "the extent to which their total visual judgment is affected by their false stereoscopic sense depends upon the predominance of perspective (uniocular) features in the field of view."<sup>5</sup>

The results of three recent investigations throw additional light on this subject and substantiate the foregoing statement. The first deals with the effect upon spatial orientation of the prolonged wearing of a meridional size lens in front of one eye, which introduces an artificial aniseikonia.<sup>6</sup> The result of the second investigation shows that the type and degree of aniseikonia present in patients can be determined by using as the criterion of measurement the incorrect binocular spatial localization which their particular

\* It is generally considered that stereopsis has a physiologic basis, founded on the anatomic organization of the visual apparatus, and affords a direct perception of the depth relationship of objects which is unequivocal although possibly incorrect. The monocular clues (the "secondary motives of depth localization of Tschermak") are said to be psychologic, since they are the result of an interpretation or conception (Duke-Elder<sup>2</sup>) of the depth relationship of objects; these clues are by their nature equivocal. Stereoscopic depth perception is assumed to be innate (that is, acquired phylogenetically), whereas the judgments based on uniocular depth clues would be empirical (that is, acquired by past individual experience). In contrast to this dualistic concept a unitary theory of depth perception is developing which considers all clues to depth perception to be the product of past experience (of the individual and the species), the governing principle being the significance or meaning of the depth relationship of objects to the organism. In such a concept (which will be elaborated by A. Ames, Jr., in forthcoming publications) there would be no room for a fundamental difference in the nature of the monocular and binocular factors of depth perception. For the purpose of the present paper the nature of the different factors is of no importance, as long as it is understood that the monocular and binocular factors are to some extent independent, but that there is, on the other hand, a significant interdependence between the two in the total act of spatial orientation.

† A size lens is a magnifying lens designed so that the virtual image seen through the lens is substantially at the same position as the object itself, but magnified. These lenses may be either overall or meridional, the latter magnifying in one meridian only.<sup>7</sup>

‡ The philosophical aspects of this rather over-simplified statement need not be considered here.

aniseikonic error should produce.<sup>7</sup> The third and most recent investigation presents evidence that a correlation exists between the measured oblique-meridional aniseikonic errors as determined by the incorrect binocular spatial localization and those computed from the magnitude and the axes of the corrected astigmatism at oblique axes.<sup>8</sup>

This paper will discuss the results of each of these investigations in so far as they provide additional information on the problem of how patients with aniseikonia deal with the incorrect binocular spatial localization associated with the existing aniseikonic errors.

### I

A meridional size lens when placed at axis  $90^\circ$  before one eye of a person with normal binocular vision introduces a change in all horizontal disparities of the images in the two eyes and therefore causes immediately a typical disorientation of objects in the individual's surroundings. If the lens is placed before the right eye, objects located in the right half of the field will appear larger yet farther away than objects of the same size located at the same distances in the left half of the field. A flat-top desk appears to slant down on the right and up on the left; it no longer appears rectangular. A wall in front of the subject will appear nearer on the left side and farther away on the right. The ground upon which the observer walks will slant down toward the right as though he were walking on the side of a hill. His hands held up before him will appear unequal in size, the right being larger. The shapes of objects will generally be distorted, a square magazine appearing trapezoidal, round objects such as ash trays, wash basins, and the like, appearing elliptical. The image of an individual looking at himself in the mirror will appear asymmetrical, with the left

side protruding. Not all individuals perceive these distortions equally well in ordinary surroundings, but they were very marked for all observers who took part in the study described in this section.

If the lens is worn constantly for several days,<sup>6</sup> the spatial distortions gradually disappear and finally are not seen at all in ordinary surroundings. It soon becomes impossible to see the distortion even when one's attention is directed closely to particular objects. The time necessary to reach this stage varies somewhat with the amount of magnification introduced by the lens, but usually three or four days are sufficient.

Thus, in so far as ordinary surroundings are concerned, the adaptation to the image-size difference between the eyes, introduced by the size lens, seems complete. However, when in an open field, or on a hill covered with high grass, or, in general, in places where there are few uniocular clues, such as perspective and rectilinear forms, the distortion reappears suddenly. This phenomenon has been experienced time and again, even after the lens had been worn constantly for over two weeks.

These observations lead to the conclusion that an individual with normal binocular vision can become accustomed to image-size differences artificially introduced by size lenses, in the sense that objects are seen in their true shape and correct position if the surroundings are such that the familiar uniocular clues are sufficient in number and strength to dominate the incorrect perceptions conveyed by the stereoscopic factors of spatial localization. Where the surroundings do not offer strong familiar uniocular clues, the stereoscopic factors become effective again and the distortion reappears. These facts suggest that in spite of the disappearance of the incorrect spatial orientation, the basic image-size difference

created by the size lens has not been overcome in the process.

This hypothesis was tested by measuring the image-size differences several times a day during the prolonged wearing of the size lens. The measurements were obtained on the horopter apparatus and the space eikonometer, both of which depend upon binocular spatial localization, and on the standard eikonometer, which depends upon the direct comparison of the apparent sizes of a dissociated test object,

The results of the measurements showed that on the whole the actual image-size difference did not disappear with the continued wearing of the lens as did the distortion of objects in space. Figure 1 shows graphically the measured image-size differences before, while, and after wearing the size lens in two experiments. There was a certain decrease in the amount of the measured image-size difference during the first few days. This decrease became less and less, until a

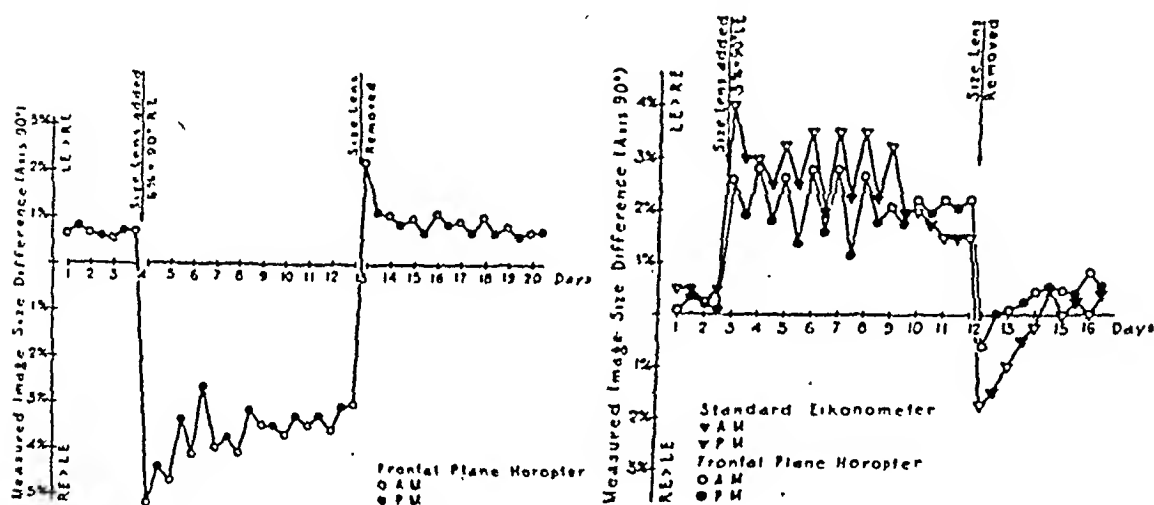


Fig. 1 (Burian and Ogle). Graphs showing measured image-size differences from day to day, in experiments on the prolonged wearing of size lenses.\*

as seen by each eye. All three instruments contain a minimum of uniocular clues. The results obtained with the three instruments were substantially in agreement in all experiments. Three persons took part in the study, each wearing a meridional size lens of 1.5%, 3%, or 6% at axis 90° before one eye, at different periods, thus introducing differences in the size of the retinal images in the horizontal meridian. The image-size differences of each subject were determined at regular intervals during the day and on each successive day before, while, and after wearing a given size lens. Each subject also reported his daily subjective experiences concerning the appearance of objects in different surroundings.

fairly constant value was reached. This change could represent a partial compensation for the image-size difference introduced by the size lens. Its magnitude varied with the subject, the magnification of the lens, and with the time of day. The compensation was greater after the day's work than in the morning after a night's sleep. The latter was especially true if an occluder was worn over one eye before the measurements were taken in the morning. The magnitude of the compensation depended also on whether the lens was worn before the right or the left eye. One subject showed practically

\*Reproduced by permission of the Archives of Ophthalmology, in which this figure originally appeared (1943, v. 30, pp. 652 and 658).

no compensation for the artificial image-size difference, even after having completely overcome the incorrect orientation caused by the size lens.

These results gave evidence that while the subjects could and did become adapted for the distortion of space in normal surroundings produced by an artificial size difference, the image-size difference itself was not, or was only partially compensated for, regardless of how long the size lens was worn. On the other hand, in surroundings where familiar uniocular clues were present, the incorrect spatial localization that should accompany such an image-size difference disappeared in a short while, but did become immediately manifest in environments where these uniocular clues were absent. There was, in other words, in some surroundings a suppression of the stereoscopic clues to depth perception under the influence of the uniocular clues which became dominant.

The spatial effect of artificial meridional aniseikonia introduced in the horizontal meridian can thus remain latent so long as there are sufficient uniocular clues in the surroundings to offset the incorrect stereoscopic perception. The relative "weight" given to the two sets of visual factors varies with the subject, some subjects being highly responsive to the stereoscopic stimuli, whereas others appear more dependent upon uniocular clues for their spatial orientation.

## II

The second investigation<sup>7</sup> that forms the basis of this discussion follows logically from the first, for if the image-size difference introduced by a size lens at axis  $90^\circ$  cannot be entirely compensated for, aniseikonic patients might be expected to show some latent incorrect spatial localization. If such is found to be the case then the incorrect spatial localization could be used to determine the type and to

measure the amount of aniseikonia present in the clinical patient.

The problem was to devise a sensitive instrument that would be able to separate the different types of image-size difference and would contain a minimum of uniocular clues, so that the test would depend solely upon stereoscopic spatial localization. This problem was solved most ingeniously by A. Ames, Jr.,<sup>9</sup> and the test is now incorporated in the so-called space-eikonometer, an instrument that measures image-size differences through stereoscopic space perception. Comparative measurements of the aniseikonia of patients were obtained on both the standard eikonometer, which does not depend upon stereoscopic vision but upon the subject's discrimination of the actual angular disparity of the images of dissociated target patterns, and on the new space-eikonometer. The measurements were for image-size differences in the horizontal and vertical meridians only. A scatter diagram (fig. 2), obtained by plotting the comparative data of over 400 subjects,\* clearly shows a tendency to cluster about a  $45^\circ$  line, and this indicates a good correlation. Statistical analysis shows the correlation to be high. About 70 percent of the measurements on the two instruments agree within 0.5 percent of image-size difference. This association is even more significant when the reliability of the standard eikonometer itself<sup>10</sup> is considered.

The results of this study are evidence that aniseikonic patients as they present themselves at the Clinic do have a latent incorrect binocular spatial localization that becomes manifest in the space-eikonometer, in which the localization of the test elements is based upon the binocular fac-

\* These graphs are essentially figures 5 and 6 of the article quoted (cf. ref. 7), to which have been added the new data of nearly 300 subjects.



tors of spatial localization. Statistically, the type and degree of the incorrect binocular space perception are what may be expected from the type and degree of the aniseikonia as measured on the standard eikonometer.

### III

The third investigation to be discussed now, deals with a similar statistical study

introduce small rotary deviations of the images of all vertical lines; that is, it will introduce a vertical declination error between the images of the two eyes.<sup>8,12</sup> This error is functionally important, for when it exists in binocular vision, lines and surfaces in space will appear incorrectly inclined away or toward the observer. Moreover, objects will appear correspondingly distorted.

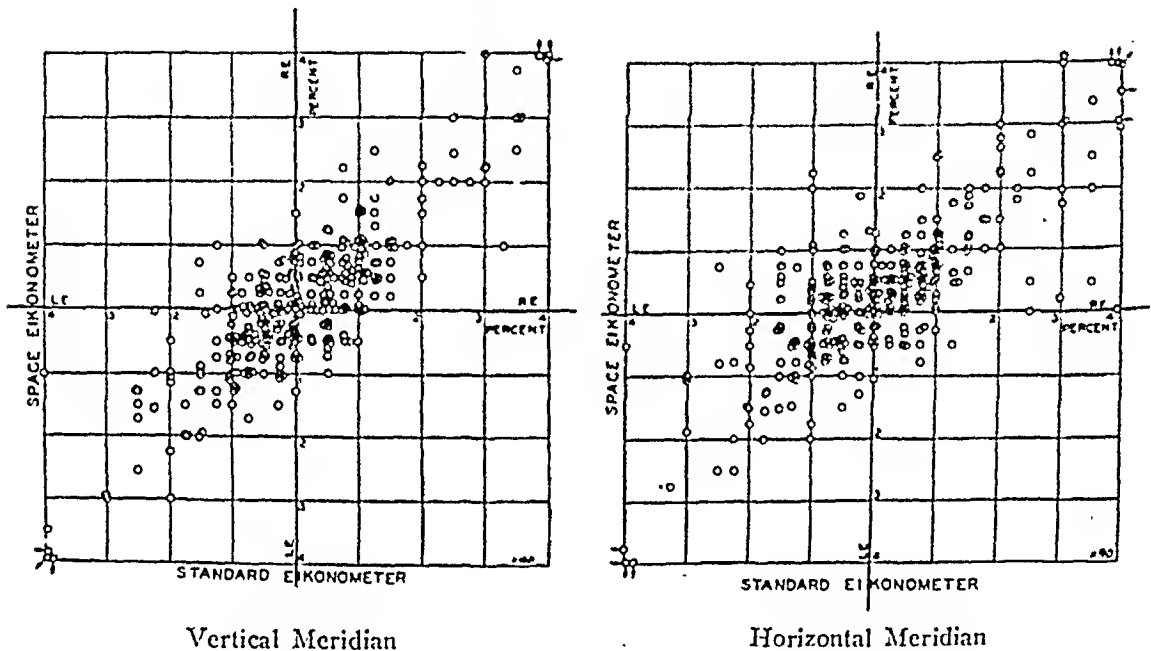


Fig. 2 (Burian and Ogle). Scatter representation of the comparative data of the aniseikonia measured upon the standard eikonometer and that measured upon the space-eikonometer.

of aniseikonia and incorrect binocular spatial localization.<sup>8</sup>

Astigmatism is a refractive (as distinguished from an axial) ametropia,<sup>11</sup> and its correction by an ophthalmic cylinder would introduce a meridional magnification (or diminution) of the retinal image. A meridional magnification, having an effect in one meridian only, produces an elongation and therefore a distortion of the image. Associated with that distortion are small rotary deviations of the images of all lines in space not parallel with or at right angles to the axis of the magnification. Thus, a meridional magnification at an oblique axis in one eye will

Thus, astigmatism at oblique axes when corrected by ophthalmic lenses, optically should introduce vertical declination errors which, in turn, should result in an incorrect inclination of binocularly seen lines and surfaces. If the degree and axis of astigmatism, as well as the physical dimensions of the correcting lenses and their distances from the eyes are known, it is possible to calculate fairly accurately the theoretical vertical declination error caused by that astigmatism. The space-eikonometer is designed to measure also the amount of the binocular spatial distortion that would be produced by vertical declination errors. Such measurements

were obtained on a comparatively large number of patients (309) with astigmatism at oblique axes, a majority of whom had worn proper corrections for a long time. These data were then compared with the calculated values. The scatter diagram (fig. 3) illustrating these comparative data clearly shows a statistical correlation.

These results give evidence that a large proportion (74 percent) of patients with astigmatism at oblique axes show, under test conditions, an incorrect binocular spatial orientation in the direction indicated by the amount and degree of the astigmatism at oblique axes. The majority of the patients tested were, however, not aware of incorrect space perception in ordinary surroundings. But it became evident in the space-eikonometer, where unocular clues to spatial orientation are kept at a minimum. This result also suggests that for a large percentage of cases in which astigmatism at oblique axes has been corrected, there is not a complete compensation for the aniseikonic error introduced, although most subjects do not notice an incorrect binocular spatial orientation in ordinary surroundings.

#### COMMENT

The evidence presented in the preceding pages can be summarized as follows.

The subjective disorientation of objects in space caused by an aniseikonia created artificially by placing a meridional size lens before one eye, gradually disappears in normal surroundings when the lens is worn continuously over a period of time. However, the greater part of the image-size difference is not compensated for and it can be measured on instruments in which unocular clues to spatial localization have been reduced to a minimum.

Statistically, patients with meridional aniseikonia in the principal meridians as well as at oblique meridians show, under

test conditions, an incorrect spatial localization. This incorrect localization can be used to determine the type and to measure the amount of aniseikonia present. Generally, the patient with aniseikonia is not aware of a distortion of objects in his surroundings.

These results help us to understand how patients with aniseikonia deal with

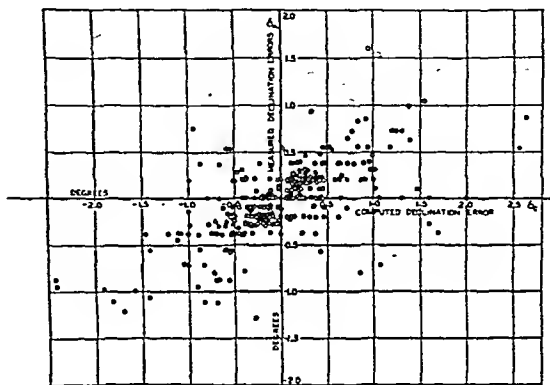


Fig. 3 (Burian and Ogle). A scatter representation of the measured and calculated data for the declination errors associated with astigmatism at oblique axes. The empirical data were determined on the space-eikonometer.\*

the problem of incorrect spatial orientation. They explain, on the one hand, why the majority of the aniseikonic patients do not report a disturbance in space perception, though some occasionally recall instances of difficulty when this possibility is brought to their attention. A few exceptional patients report spontaneously a spatial distortion. On the other hand, the foregoing findings demonstrate clearly that the mere fact that a patient has become accustomed to a new pair of glasses which at first caused spatial distortion, does not mean that the aniseikonia introduced by the correction has actually been overcome or compensated for, as has been claimed.<sup>13</sup>

This point is illustrated by the follow-

\* Reproduced by permission of the Archives of Ophthalmology, in which this figure originally appeared (1945, v. 33, p. 124).

ing case: D. H. B., a college student aged 17 years, had not worn glasses for two years. Upon examination the following correction was prescribed: R.E.  $+0.25$ D. sph.  $\approx -1.00$ D. cyl. ax.  $90^\circ$ ; L.E.  $+0.50$ D. sph. With this he had 20/20 vision in each eye. There was no significant muscle imbalance, and the stereoscopic vision was normal. When the patient put on the spectacles with the prescribed correction, he immediately reported that objects and surfaces appeared distorted. The distortion described was typical of an aniseikonia in which the image of the left eye was larger in the horizontal meridian (axis  $90^\circ$ ). This type of aniseikonia would be anticipated on the basis of the anisometropia. Measurements on the space-eikonometer showed that he needed an aniseikonic correction of: R.E. 1% mag. overall  $\approx 1.5\%$  mag. axis  $90^\circ$ , to make the test elements appear correctly oriented.

The patient was asked to wear the refractive lenses constantly for a time during which he was to note the appearance and any change in the appearance of his surroundings. He returned for reexamination at the end of a week, and reported that the distortion of objects had gradually decreased and that it had practically disappeared at the end of the third day. If he removed the spectacles, however, he immediately saw a distortion of his surroundings but in the direction opposite to the original distortion. The measurements on the space-eikonometer gave: R.E. 1% overall  $\approx 2\%$  axis  $90^\circ$ . Without the glasses no image-size difference was measurable within  $\pm 0.25$  percent at axis  $90^\circ$  and  $\pm 0.5$  percent at axis  $180^\circ$ .

The patient continued to wear the spectacles and returned again at the end of nine days. The measurement on the space-eikonometer at that time was R.E.: 0.5% overall  $\approx 1.75\%$  axis  $90^\circ$ . Further meas-

urements could not be made because the patient left college for the Service.

This case shows clearly that whereas the spatial distortions caused by the new anisometropic correction disappeared almost entirely in ordinary surroundings, the image-size difference which gave rise to those distortions did not disappear.

In conclusion, the following may be stated about aniseikonia and spatial orientation. Meridional aniseikonia always entails some type of incorrect spatial localization. One cannot compensate for it, or, at best, for only a fraction. For the most part, the effects of aniseikonia on spatial orientation are not perceived, since everyday surroundings, as a rule, offer uniocular clues in such abundance that they dominate the binocular data and rectify the incorrect spatial relationship of objects that would result from the binocular data alone. Patients with meridional aniseikonia are, therefore, not generally aware of an incorrect spatial orientation. However, the latent incorrect spatial localization becomes immediately manifest in surroundings where uniocular data are absent. The faulty spatial orientation may sometimes appear in normal surroundings if the patient is fatigued or under emotional stress.

These facts suggest that the stimuli for an incorrect spatial localization are present constantly, and, even though the distortion is not apparent, they could nevertheless be a source of conflict in space perception. The answer to the question, to what extent this conflict between two ever-present sets of visual clues may be the cause of the ocular discomfort experienced by so many patients with aniseikonia, is not within the scope of this paper.

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# GLAUCOMA AND ESSENTIAL PROGRESSIVE ATROPHY OF THE IRIS

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During the 40 years since the first clear description of essential progressive atrophy of the iris by Harms<sup>1</sup> was published, only 47 instances of this condition have been reported. Its cause remains obscure, although the probable basis for the associated glaucoma has been indicated. A case with some interesting clinical features is therefore being reported.

## CASE REPORT

A private, aged 21 years, was admitted to Barnes General Hospital on March 6, 1943. He had known of a deformity of the pupil of the right eye since 1936, when he consulted a physician because of a hordeolum. The appearance had not changed since that time. In January, 1943, blurring of the vision of that eye was noticed, particularly in the morning. It would usually clear up toward noon. There was no associated pain nor headache.

On examination the visual acuity was: R.E. 20/40, J4; L.E. 20/30, J1. The lids, cilia, lacrimal apparatus, and extraocular muscles were normal. The conjunctivas were pale.

*Right eye:* The cornea was 10 mm. in diameter. The corneal refraction was 42.5D. The cornea showed no evidence of inflammatory deposits, but definite endothelial bedewing was present; as a result, there was a slight amount of epithelial edema. At the 9-o'clock area a peripheral anterior synechia was visible. The anterior chamber was 2.86 mm. in depth.<sup>2</sup> No flare was visible in the aqueous. The pupil was irregular and drawn over toward the nasal limbus. The sphincter was intact and reacted promptly to light stimuli. The iris was light blue in color.

From the sphincter area to the temporal limbus in a horizontally oval area, 6 mm. long and  $2\frac{1}{2}$  mm. wide, all layers of the iris were absent except for a few thin stromal strands which moved with changes in the size of the pupil. Below this area and parallel to it was an area of the same dimensions in which only the pigment epithelial layer remained. Some stromal atrophy was present at the upper and lower iris periphery. The lens capsule was transparent and had a few triangular pigment deposits at the area behind the pupil. The lens and vitreous were clear. The retina and its vessels were entirely normal. The intraocular pressure (Schiotz) was 26.5 mm. of mercury.

Gonioscopy revealed that the rim of iris nasal to the pupil seemed more compact than the remaining iris. The iris peripherally was adherent to the trabecular wall of the chamber angle. Even where the iris was completely absent and the normal ciliary processes were visible, the trabecular wall was covered by the brown remnants of pigmented epithelium. At the 9-o'clock area the anterior synechia extended slightly onto the back of the cornea.

*Left eye:* The cornea was 11 mm. in diameter. The corneal refraction was 43D. in the 85-degree meridian and 42.5D. in the 175-degree meridian. No deposits nor edema was visible in its layers. The anterior chamber was 2.82 mm. in depth. No flare was visible in the aqueous. The pupil was 4 mm. in size, round, and reacted normally to light. The blue iris was normal in all its markings. The lens, vitreous, and optic disc were entirely normal. The retina and retinal vessels showed no abnormalities. The

visual fields were normal. The intraocular pressure was 15 mm. of mercury (Schiotz).

Gonioscopy revealed some gray mesodermal network bridging portions of the angle recess with a large vessel at the 9-o'clock area. The trabecular wall appeared normal. Blood could be seen in Schlemm's canal.

Refraction (with 5-percent homatropine hydrobromide cycloplegia) revealed the following corrected visual acuity: R.E. 20/30, J2 with  $-0.75D.$  sph.  $\approx +50D.$  cyl. ax.  $15^\circ$ ; L.E. 20/20, J1 with  $+0.62D.$  cyl. ax.  $180^\circ$ . The intraocular pressure following cycloplegia was R.E. 30 mm., and L.E. 15 mm. (Schiotz).

The general physical examination revealed no abnormalities. Results of laboratory studies were as follows: erythrocytes 4,310,000 per cu. mm.; leukocytes 7,100, 20 percent of which were eosinophiles, 43 percent segmented polymorphonuclear cells, 34 percent lymphocytes, and 3 percent monocytes. The blood hemoglobin was 83 percent. Urinalysis was negative. The blood Kahn test was negative. Fasting blood chemical analysis: Nonprotein nitrogen 25.9 mg. percent, sugar 100 mg. percent. A repeated eosinophile count revealed 31 percent blood eosinophiles. A stool examination and subsequent repeated examinations revealed ova of the hookworm (*Necatur americanus*). On April 5, 1943, treatment with 3 c.c. of tetrochloroethylene was instituted. Three subsequent stools were negative for ova. An examination two months later was negative. In 1929 or 1930 routine examination in school had first revealed the presence of hookworm eggs. Treatment was given at this time. Again in 1935 or 1936 a routine examination was positive for hookworm ova. No treatment had been given.

A diagnosis of essential progressive

atrophy of the iris was made. The infestation was considered as probably coincidental but deserving investigation.

On the next three days the ocular tension was taken several times daily and remained at R.E. 26.5 mm. Hg, L.E. 15 mm. In spite of this the cornea of the right eye was edematous during the morning and cleared up during the forenoon. Pilocarpine nitrate, 2 percent, was used in the conjunctival sac of the right



Fig. 1 (Sugar). Appearance of iris holes in an eye with essential atrophy of the iris.

eye beginning March 9, 1943, four times daily. No change in ocular tension resulted. On March 10, 1943 the ocular tension was R.E. 35 mm. and L.E. 15 mm.

On March 11, 1943, a cyclodialysis operation was performed under local anesthesia. The spatula was inserted below and nasally 5 mm. from the limbus and swept around temporally to cause a cyclodialysis from the 4:30- to 7:00-o'clock areas of the corneal circumference. No hyphemia resulted. The convalescence was uneventful. The ocular tension of the right eye remained at 16 to 19 mm. thereafter. Gonioscopy revealed an open cyclodialysis cleft. No elevation of tension nor change in appearance of the iris was found during a period of two years of follow-up.

## COMMENT

Essential progressive atrophy of the iris is apparently a disease entity characterized by a slowly progressive atrophy of the iris tissue resulting in the formation of holes in the iris, and nearly always is associated with glaucoma. It usually starts with an eccentric position of the pupil. Ectropion of the pigment epithelium of the iris occurs, and gradually holes appear in the iris on the side opposite the eccentric pupil. Eventually peripheral anterior synechiae form, and the signs of glaucoma supervene.

The disease has been reported in 47 cases, the features of a few of which suggest the possibility of their being secondary to another condition, such as inflammation or hydrophthalmos. For this reason Henderson and Benedict<sup>2</sup> divided the 28 cases they reviewed (including their own case) into three groups. Group I included 12 cases observed prior to the onset of glaucoma. Group II included cases observed after the onset of glaucoma. In neither of these two groups was any etiologic factor found. In Group III were included those cases which might be considered other than those of essential progressive atrophy of the iris. In the first two groups the age of onset of the iris defect varied from 20 to 48 or 49 years, averaging about 30 years. In all but 2 of the 12 cases glaucoma eventually developed in from slightly less than 1 year to 8 years. Only 2 of the 12 patients were males.

Two problems arise in considering this disease; first, the cause of the iris atrophy, and, second, the cause of the glaucoma. Let us discuss the second problem first.

Anatomic studies have been made in late cases only, so that the only early evidence available is from gonioscopy. The chamber angle has been observed

in only five reported cases, those of McKeown,<sup>4</sup> Post,<sup>5</sup> Scharf<sup>6</sup> (two patients), and my own. Troncoso examined McKeown's patient and reported: "The examination of the angle of the anterior chamber at this place [below] showed a wide anterior peripheral synechia, which is attached to the limbus rather forward, almost to the transparent edge of the cornea. This synechia is partial. On each side the angle is open, the brown band of the ciliary body being clearly observed. The canal of Schlemm is not apparent and merges with the white sclera. In the upper part of the angle the coloboma does not reach the scleral limbus. A narrow stump of the retinal layer of the iris remains. Behind it, the ciliary processes appear and show no evidence of inflammatory disease. On the nasal side of the coloboma there is also a narrow anterior peripheral synechia. Except for these synechiae the angle is open all around the limbus." Glaucoma was not present at the time of this examination. In Scharf's first case the angle was closed in the area of coloboma but free on each side of the coloboma. A synechia was present above, from the 10- to the 4-o'clock areas. The lower nasal quadrant was open. In this case no change was found 4½ years later when the ocular tension rose to 35 mm. of mercury (Schiøtz). In the second case with ocular tension between 33 and 40 mm. of mercury, the angle was blocked in the coloboma areas, but became normal away from these places. Marked pigment deposits were visible in Schlemm's zone. In Post's case with glaucoma the angle was obliterated. In my own case, a borderline case with early glaucoma, the angle was covered by peripheral anterior synechiae. It is important, in considering Scharf's cases, to distinguish between a normal angle and one in which only the

portion of the trabecula anterior to Schlemm's canal is visible, since this area is apparently not significant in the resorption of aqueous. The drawings in Scharf's article suggest that Schlemm's zone is really blocked in the areas considered by him to be normal.

In all the eyes examined after enucleation (Ellett,<sup>7</sup> Rochat and Mulder,<sup>8</sup> Liesko,<sup>9</sup> Feingold,<sup>10</sup> Rones,<sup>11</sup> Wood,<sup>12</sup> Bietti,<sup>13</sup> Bentzen and Leber,<sup>14</sup> and Ruby)<sup>15</sup> the angle was obliterated by a peripheral anterior synechia in every case. A hyaline membrane extended across the new angle and iris in the cases of Rochat and Mulder, Liesko, Feingold, and Rones (figure 7 in Rones's report).

Several theories have been advanced to explain the glaucoma. Feingold<sup>10</sup> suggested that the glaucoma was produced by irritating substances which were elaborated as a result of iris-tissue destruction. Kreiker<sup>16</sup> believed that cellular detritus from the iris-tissue disintegration occluded the chamber angle. Liesko<sup>9</sup> considered the glaucoma to be due partly to dissemination of pigment from the atrophic iris and partly to a decrease of the available surface area for resorption of intraocular fluid. Waite<sup>17</sup> believed the latter to be the cause of glaucoma. In Rochat and Mulder's<sup>8</sup> opinion the principal factor is the formation of peripheral anterior synechiae. The evidence of the microscopic examinations and most of the gonioscopic examinations tends to confirm Rochat and Mulder's theory.

The cause of the iris atrophy, similarly, has been explained in many ways. Feingold<sup>10</sup> believed it due to a congenital vascular disturbance of the smaller iris circle. The lack of involvement of the sphincter is against this view. Waite<sup>17</sup> held that the atrophy was the result of a mechanical stretching of the iris tissue, which causes a narrowing and occlusion

of the radial arteries, producing a nutritional disturbance of the tissues in all portions other than that supplied by the lesser circle. Larsson<sup>18</sup> believed it to be a congenital anomaly. Kreiker suggested that a cytolytic process, normally operating in embryonic life, becomes active in adult life and attacks the normal iris tissue. Similarly de Schweinitz<sup>19</sup> believed the atrophy to be due to local abiotrophy. Von Grosz<sup>20</sup> attributed the atrophy to a hereditary feebleness of the iris of neurogenic character. Rochat and Mulder<sup>8</sup> considered the atrophy to be due to mechanical distension of the iris tissue on the side opposite the eccentrically situated pupil. Against this theory is the fact that many cases have been observed in which the pupil was drawn up for many years after a cataract extraction, but no hole formation in the iris resulted.

Several interesting facts were observed in a review of the cases described in the literature. One of these was the finding of almost complete destruction of the endothelial cells on the posterior corneal surface in Griscom's<sup>21</sup> case. A similar involvement of the endothelium was present in my case. This resulted in corneal edema which was most prominent in the morning, without relation to the intraocular pressure. Another observation was the presence of a yellow spot on the iris in Stieren's<sup>22</sup> case, and in two cases (Rochat and Mulder,<sup>8</sup> Henderson and Benedict<sup>3</sup>) the microscopic evidence that the iris tissue was more compact between the pupil and the limbus where it was drawn toward the limbus. This was present clinically in my own case. In Rochat and Mulder's case "the tissue of the iris firmly attached to the cornea in the angle of the anterior chamber was not rarefied as in other parts but, on the contrary, was more compact. A new tissue had formed in the angle of the anterior chamber



containing many oblong cells with their nuclei parallel to the layers of the cornea. This accumulation of cells was in some spots so abundant that it almost resembled a small sarcoma of the iris root."

### SUMMARY

A case of progressive atrophy of the iris with increased intraocular pressure

is reported. The presence of endothelial involvement and increased density of the iris at the area toward which the pupil was drawn were observed. The presence of increased intraocular pressure was explained by the dense peripheral anterior synechiae. No attempt is made at present to explain the cause of the iris atrophy. *Barnes General Hospital.*

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# OBSERVATIONS ON RETINAL BLOOD FLOW WITH THE AID OF KUKÁN'S OPHTHALMODYNAMOMETER\*

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Measurements of intraocular vascular pressures have been made by means of Kukán's ophthalmodynamometer,<sup>1,2</sup> the essential feature of which is a suction cup, 11 to 13 mm. in diameter, for application to the scleral surface of the (human) eyeball, with connections to a vacuum manometer for registering the amount of reduced pressure applied to the globe. We have used this apparatus with cups of various sizes, ranging from 5 to 10 mm. in diameter, on the eyes of cats under nembutal anesthesia. When the fundus is viewed through an ophthalmoscope, gradual lowering of the pressure in the cup results first in a slowing of the blood flow in the retinal veins. With further decrease in pressure the blood flow slows in the arteries. Soon the blood cells appear as separate clumps, first in the veins, then in the arteries. The flow now stops in the arteries, then actually reverses its direction. Finally the veins become empty, collapse, and can no longer be seen, and the arteries in their turn disappear. The following typical record shows the various pressures at which the more striking of these changes were observed in one of our experiments:

- 420 mm. Hg—blood slowed in veins
- 390 mm. Hg—blood slowed in arteries
- 360 mm. Hg—blood separates in clumps in veins
- 220 mm. Hg—blood separates in arteries and flow begins to reverse

200 mm. Hg—collapse of veins and arteries

The exact interpretation of these results is still in doubt. Linksz<sup>2</sup> in his analysis of the physical principles involved in the use of Kukán's cup states that intraocular pressure is increased by suction applied to a portion of the outer surface of the eyeball; but because a small amount of fluid is squeezed out of the eyeball the increase in intraocular pressure is not directly proportional to the reduced pressure in the suction cup. The intraocular pressure and the sub-atmospheric pressure exerted on the eyeball do, however, have a fairly linear relationship within certain limits, so that all that is necessary for practical purposes is the use of a factor for one to be able to read intraocular pressures directly from the Kukán ophthalmodynamometer.

On the other hand von Dubois and Tischer<sup>3</sup> claim that application of Kukán's cup to the rabbit's eye produces no change in intraocular pressure as measured by a Verhoeff manometer, but only a decrease in extra- and intraocular venous pressures, an increase in bulbar volume, and an increase in rigidity of the bulbar wall. According to these investigators the only method for raising intraocular pressure is the application of suction to the whole orbit and its neighboring parts.

We agree with Linksz that application of the Kukán cup does increase intraocular pressure. This was measured in our experiments by direct cannulation of the aqueous humor through the cornea. When the pressure in the cup was lowered to some 200 mm. Hg, the intraocular

\* From the Division of Physiology, University of California Medical School. Aided by a grant from the Research Board of the University of California.

pressure was increased by 17 to 20 mm. Hg, giving a factor of 0.1.<sup>2</sup>

Our use of the Kukán cup was as an aid in exploring the functions of the long ciliary nerves in relation to the blood supply of the eyeball.

Suction was applied to the eyeball of the nembutalized cat just sufficient to stop the blood flow in both arteries and veins of the retina. While this degree of suction was maintained, the cervical sympathetic nerve was stimulated. After a very short latent period blood began to appear in clumps in arteries, then in veins, and within a very few seconds blood was flowing through the retinal vessels in a steady stream. This observation could be repeated on the same preparation an indefinite number of times provided a rest of at least 10 minutes was allowed between trials.

The same result was obtained on stimulation of the cervical sympathetic when the group of either short or long ciliary nerves was cut, or both groups together.

The same result was obtained on stimulation of the central stump of any one of the long ciliary nerves when all four long ciliary nerves had been cut.

It seems logical to conclude that the return of circulation in the empty and collapsed retinal blood vessels through stimulation of the cervical sympathetic is the result of generalized increase in blood pressure in the whole head region. Even if nerve impulses passing from the cervical sympathetic out over the long ciliary nerves might possibly under normal cir-

cumstances have resulted in vasodilatation, this effect would have been nullified by the increased intraocular pressure which would have kept the dilated vessels collapsed and empty. Furthermore, circulation was observed to return when all the ciliary nerves, both short and long, were cut. This is experimental proof that the reopening of the collapsed vessels could not have been the result of stimulation of vasomotor fibers within the eyeball. The effect must come from outside the eyeball. It would seem that the return of circulation on stimulation of the central ends of the cut long ciliary nerves is to be explained as the result of stimulation of sensory fibers which reflexly increase the blood pressure in the head region around the eye. These fibers are undoubtedly sensory fibers of the trigeminal nerve which are known to travel in the long ciliary nerves.

#### SUMMARY

1. Application of Kukán's cup to the eye of the cat under nembutal increases intraocular pressure sufficiently to stop blood flow in the retinal vessels.

2. Stimulation of the cervical sympathetic increases the blood flow in the retinal vessels, probably because of increased blood pressure outside the eyeball.

3. Sensory fibers in the long ciliary nerves can reflexly increase the blood flow in retinal vessels evidently by this same mechanism, since the effect is produced when both long and short ciliary nerves are cut.

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# RECURRENT JUVENILE PAPILLOMA OF THE CONJUNCTIVA\*

## A CASE REPORT

JOSEPH DUDGEON WALKER, M.D.

*Houston, Texas*

A unique conjunctival condition is presented, for which the patient was treated for more than five years before a cure was achieved.

The subject of recurrent papilloma of the conjunctiva may be thought of in terms of juvenile ectodermal outgrowths, inasmuch as the tumor is made up of young epithelial cells and involves only the most superficial epithelium. Juvenile papillomata of the conjunctiva are rare; I have observed only one during my medical career. The growth was superficial, multiple growths appearing evidently by contact infection or contact implantation, movable with the conjunctiva, and with a tendency to recur, whether partially or completely removed.

### CASE REPORT

Baby J. R., white, aged three months, had light reddish hair, blue eyes, and was well developed and nourished. There had been epiphora of the right eye since the age of three weeks. The mother and father were living and well, as were two sisters, both of whom were myopic. The father and all three children had red hair; mother was blond. All had very thin skins which sunburned easily, but no member of the family had ever been treated for any skin lesions.

The eyelids, conjunctiva, and cornea were clear; the fundus was myopic. The inner angle of the right eye was filled with mucoid material. The left eye was normal.

I first saw this patient on account of

\* Read before the Academy of Ophthalmology and Otolaryngology of Harris County, Texas.

epiphora of the right eye on March 10, 1935, at which time the lacrimal duct was probed and irrigated. The patient completely recovered from the epiphora but returned five months and three days after the first visit, with a small raspberrylike mass at the opening of the lower punctum. Under ether anesthesia the mass was dissected away, but was found to involve the mucous membrane of the canaliculus. The portion inside the canaliculus was cauterized with a heated lacrimal probe. The growth quickly recurred and was found to have attached itself to the bulbar conjunctiva and caruncle as well as to the edges of the upper and lower lids. The tumor was removed by dissection on September 27, 1935, and again on October 27, 1935, just one month after the previous operation, and again on the following dates: June 20, 1936; October 22, 1937; July 7, 1938; October 14, 1938; January 23, 1939, and April 10, 1939.

After having removed this tumor by dissection nine times, the papilloma was again observed at the lower punctum of the right eye, spreading to the inner angle, associated with the caruncle and plica, and in the fornices. Still later it spread in considerable numbers over the entire mucous membrane of the lids and bulb. This growth was superficial, never penetrating through the basement membrane of the conjunctiva. It was movable with the conjunctiva and easily removed by light dissection with very sharp iris scissors.

On March 1, 4, and 8, 1939, the patient was given 100 r units of X ray over the papillomatous areas; that is, 300 r units

in all. There was no visible improvement and the tumor recurred as it had done previously.

On May 1, 1939, and again on June 1, 1939, the tumor was removed by dissection and radium was applied. There was no appreciable difference in the amount of improvement noticed after the use of X ray or radium, in conjunction with careful dissection, and after dissection alone. The use of radium and X ray was definitely and permanently abandoned, since, following irradiation, the patient suffered a severe conjunctival reaction, evidenced by loss of lashes of the upper lid.

The tumor continued to recur in much the same manner as before, attaching itself to the bulbar conjunctiva, caruncle, fornices, and lid margins. It was removed by dissection on September 7, 1939, and again on March 11, 1940. At this time 1 gr. of sulfanilamide per pound of body weight for three days was prescribed to be repeated after an interval of two weeks. The tumor was removed by dissection on August 31, 1940, for the fourteenth and last time. It has not recurred since. The sulfanilamide was to be continued as noted for six months after the last operation. This completed five years of continuous observation and treatment.

A check-up on October 5, 1942, revealed the patient's vision O.S. and O.D. to be 20/200.

**EXAMINATION.** *Right eye:* A few cilia were missing from the inner angle of the upper lid. The mucous membrane over the tarsus of the upper lid showed a first-degree cicatrix. No adhesions were to be seen. The conjunctiva, where dissection alone had been done or in combination with superficial cautery, showed no evidence of a scar. The punctum was wide open, and no evidence of the tumor could be seen. The cornea was clear; the lens showed some peripheral changes in the

subcapsular epithelium and lens fibers; the media were clear and the fundus normal except for myopia. *Left eye:* The lids, conjunctiva, and fundus were normal, the media and lens clear.

The following lens prescription was required for vision of 20/40 in each eye: O.D. -3.00D. sph.  $\approx$  -.75D. cyl. ax. 180°; O.S. -3.00D. sph.  $\approx$  -.50D. cyl. ax. 180°.

During observation of this patient several biopsy specimens were taken. One was reported upon by Dr. L. A. Myers, as follows: "Sections show a biopsy specimen about one-half the size of a pea, composed of orderly folds, trabeculae and fingerlike projections of thick strata of squamous epithelium arranged on variable-sized cones of connective tissue. The cells show considerable activity or hyperplasia. The degree of differentiation is sufficient definitely to indicate a benign condition. Impression: Benign papilloma."

A biopsy specimen reported upon by Dr. Violet Keiller is as follows: "Microscopic epithelial papilloma of villous type. The flat epithelium composing it is very active but is not now malignant."

In some of the cases reported in the literature as papilloma, the microscopic findings and the names of the pathologists who interpreted them were not quoted. Wolff ("The pathology of the eye," 1934, p. 35) describes papilloma of the conjunctiva as pedunculated or sessile, the pedunculated types being confined to the bulbar conjunctiva and the sessile to the limbus and the cornea. "The centre, or mesodermal core, of the tumor, consists of connective tissue, vessels, and dilated lymphatics." Papillomata are new formations upon the surface without downward extension. They "... arise most frequently around the caruncle and upper fornix, but may occur anywhere on the

conjunctiva. They may be multiple and cover a large area." These tumors are potentially malignant.

Papillomata must be differentiated, in diagnosis, from epibulbar carcinoma, epibulbar sarcoma, simple granuloma, polyp, angioma, cyst, lipoma, dermoid, precancerous melanosis, and diffuse malignant melanoma. The relative amount of epithelium, blood vessels, and fibrous tissue determines the classification. The typical papilloma is soft, red, and pedunculated, with delicate fingerlike processes. Its surface is like that of a raspberry or cauliflower. Most of the tissue is epithelium, but some fibrous tissue and hyperplasia of the subepithelium are present.

In making a diagnosis of papillomatosis of the conjunctiva a careful history as well as careful inspection of the growth under good illumination and lens magnification is imperative. Certain malignancies are prone to become more active when disturbed surgically, therefore a biopsy specimen should be sent to the laboratory and the microscopic diagnosis made while the patient is upon the operating table.

Trauma, such as from instrumentation and rubbing of the eye by the patient, may contribute to recurrence. Dietary, endocrine, allergic, and chronic inflammatory conditions must also be considered as primary etiologic factors.

In treatment the most effective procedure for removal is dissection, it being understood that in benign papilloma it is neither necessary nor advisable to take deep, wide sections of the conjunctiva beneath the growth, because the basement membrane of the conjunctiva is not invaded. High-frequency current or Shahan's thermophore may be satisfactorily used. X ray and radium did not prove to be of any benefit in the present case, but if it is used the eye must be shielded by a thin leaden plate, molded to fit the globe.

Local instillations of vitamin-A concentrate and estrogenic hormone in oil into the conjunctival sac may be of great benefit. Since riboflavin (vitamin B<sub>2</sub> or G) in certain selected cases will cause pannus and other avascularizations of the cornea and limbus to disappear, this should be tried, together with large doses of vitamin A. Vitamin B<sub>1</sub> should also be given in large doses in order to arrest any nervous symptoms and to stimulate the appetite. The eye should be kept clean with mild astringents and irrigations of 2-percent boracic-acid solution. Estrogens have a definite developmental effect upon juvenile epithelium, briefly converting it into adult type, with a markedly increased resistance to infection; therefore, the follicular hormone may be given intramuscularly. This was not done in the present case since I had had no experience with it in eye conditions and because the child's parents wanted assurance that the administration of the drug would not produce early sexual development.

Considerable time should be allowed for spontaneous recovery, since infantile papillomatous tissue found in the larynx and elsewhere in the body tends to stop growing at about the time of puberty.

From the history in the literature, papillomata may not be innocent growths. A number of cases have been reported by reliable authors to prove conclusively that they are capable of malignant degeneration. These tumors occur most frequently at the inner canthus and the corneoscleral margin, rarely on the cornea.

These growths are best removed surgically, and if X ray or radium is used every precaution should be taken to protect the lens since, according to Wolff, "Cataract may be produced by ultraviolet light, X ray and radium acting directly upon the subcapsular epithelium or ciliary epithelium and on the lens fibres." A biopsy specimen should be taken from

all papillomata and careful microscopic studies made. Papillomata should be completely removed by superficial surgery or high-frequency current, care being taken to remove no large pieces of conjunctiva,

and, thus obviating the necessity of later correcting cicatricial defects by plastic surgery.

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## NOTES, CASES, INSTRUMENTS

### FOREIGN BODY IN THE LACRIMAL SAC\*

FRANK D. COSTENBADER, M.D.  
*Washington, D.C.*

No case of foreign body in the lacrimal sac has been found in the literature.

#### CASE REPORT

K. R., a white female; aged seven months, was first seen on August 14, 1944, because of an epiphora and mucopurulent discharge from the left eye since birth. The right eye had been normal. The patient was one of twins, and the twin had no ocular trouble.

*Examination.* The results were normal except for the condition of the left eye.

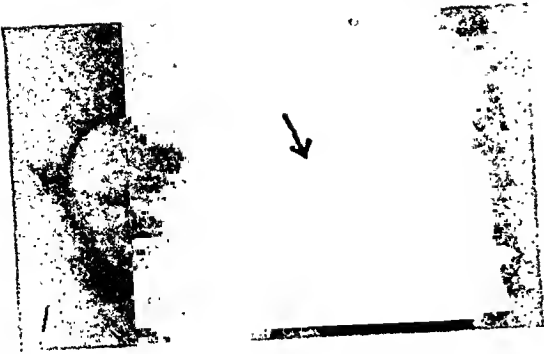
*Left eye.* There was marked epiphora with moderate mucopurulent discharge expressed from the lacrimal sac, and free in the conjunctival sac. The puncta were patent and the globe entirely normal. A stenosis at the lower end of the lacrimal sac was diagnosed.

*Treatment and Follow-up.* Massage over the left lacrimal sac followed by boric-acid irrigations three times a day was advised, but after two weeks there was no improvement. On August 31st, under ethyl-chloride anesthesia, a probing was undertaken, with the use of a No. 1

sterling-silver olive tipped probe that had been bent about 1 cm. from its end and straightened. This probe had been in use about 10 months. The lower punctum was dilated, the probe introduced and guided to the sac. On making the right angle turn at the sac, the probe was felt to "give" and was withdrawn. It was immediately apparent that the distal 6 to 8 mm. of the probe were missing. Attempts to massage the canaliculus, and to irrigate through the upper punctum while compressing the lower end of the lacrimal sac, were not successful in removing the piece of probe. On further probing, with sizes up to No. 4, the scraping against metal could be felt, but the broken probe remained in position. Finally, another No. 1 probe was passed into the sac through the occluded lower end of the sac into the nasolacrimal duct. The sac was irrigated freely, and the patient had no further epiphora nor discharge from this time.

X-ray examination on September 6th revealed a clean-cut metallic foreign body, about 8 mm. in length, lying horizontally at about the level of the inner canthal ligament (figs. 1 and 2). On September 7th, with the patient under ether anesthesia, the lower punctum was probed again and the feeling of metallic foreign body was still present in the distal end of the canaliculus. Further probing with larger probes seemed to push the foreign body into the sac, and no grating could be felt. X-ray examination immediately following the probing on September 7th

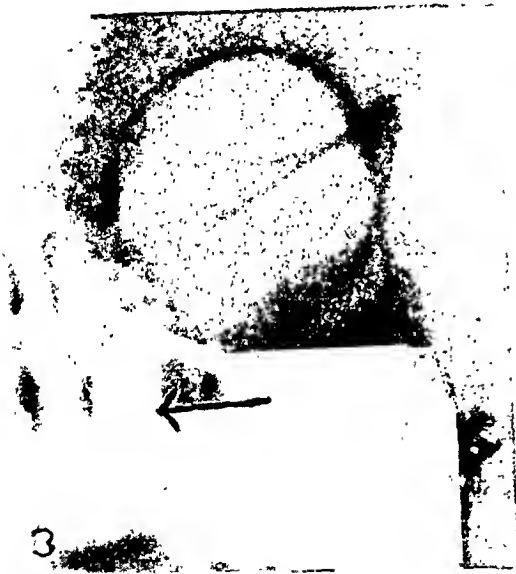
\* Presented on December 2, 1944, before the 2d annual meeting of the Department of Ophthalmology, George Washington University, School of Medicine.



Figs. 1 and 2 (Costenbader). X-ray studies made on September 6, 1944, showing location of foreign body.



2



Figs. 3 and 4 (Costenbader). X rays taken on September 7, 1944, showing foreign body in the lacrimal sac of the left eye.



4

revealed an 8-mm. clean-cut foreign body lying vertically at about the level of the lower end of the lacrimal sac (figs. 3 and 4).

The parents were informed of the further progress of the foreign body, were assured that it would not be spontaneously extruded, and advised that it would have to be removed through incision of the lacrimal sac. The day before the patient had been scheduled for removal of the

foreign body (September 19th), further X-ray studies were made and revealed no foreign body present, on three views. The foreign body had not been observed by the parents in the nasal secretion, or elsewhere and could not be accounted for. To make doubly certain, further X-ray studies were made on November 3d, but no evidence of foreign body could be found. The patient continued to be free from epiphora and dis-



charge, and was physically unharmed by her unfortunate experience.

#### COMMENT

A case of foreign body of the lacrimal sac has been presented with two things in mind: 1. The ordinary lacrimal probes

can and will break, and in this case a portion did remain in the lacrimal sac for a period of time. 2. The nasolacrimal duct is apparently large enough in many individuals to extrude spontaneously the olive tip of a No. 1 lacrimal probe.

1150 Connecticut Avenue, N.W. (6).

## SOCIETY PROCEEDINGS

EDITED BY DONALD J. LYLE

### MEMPHIS SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

February 8, 1944

DR. T. F. LEATHERWOOD, *presiding*

#### AN UNUSUAL CASE OF GLAUCOMA

DR. PHIL LEWIS again presented B. C., a colored man, aged 74 years, whom he had shown at the last meeting.

A recent trephining operation on his poorer eye lowered the tension from 50 mm. to 25 mm., but there was no improvement in central vision or visual fields. Following the operation on the left eye, the tension of the right eye, which before could not be reduced below 40 mm. by various miotics, was remaining under 30 mm., with the same dosage of drugs. Other interesting and unusual features in this case were the concentric contraction of the fields to 10 degrees and the lack of cupping of the discs. The only positive finding on general, neurologic, and laboratory examination was an arteriosclerosis of moderate degree.

#### MYASTHENIA GRAVIS

DR. RALPH O. RYCHENER reported a case of myasthenia gravis in an auto mechanic, aged 43 years, who had suffered from double vision for seven weeks. Dur-

ing this interval he had many physical examinations which revealed nothing of importance.

On November 3, 1943, there was almost complete ptosis of the upper lid of the left eye. The palpebral fissure measured 3 mm., and the patient was unable to raise the lid above this point.

There was vertical diplopia, indicating a paresis of the superior oblique muscle of the left eye. After intramuscular injection of 0.5 c.c. prostigmin methylsulfate 1:2,000, the left palpebral fissure opened to 7 mm. without effort, and the patient stated that his eye felt much improved. He was placed on oral therapy of prostigmin bromide 15 mg. t.i.d., and reported in a month with complete recovery of the ptosis and elimination of diplopia except in the extreme inferior field on the right side. Here it was possible to fuse the images by effort. He had returned to his work and was carrying on in a normal fashion. Treatment was continued.

#### OCULAR SENSITIVITY TO SULFATHIAZOLE

DR. J. WESLEY MCKINNEY reported that L. T., aged 19 years, gave a history of frequent styes and redness of the eyelids for several months. There were a mild conjunctivitis and marginal blepharitis, for which sulfathiazole ointment had been given.

She returned in one month, having used the ointment intermittently during that time, mainly in the right eye, since the left eye had not caused any difficulty. She stated that for the past several days the right eye had been red and sore. The bulbar and palpebral conjunctiva was markedly injected. There were several staining ulcers astride the limbus below with surrounding hypertrophy resembling that of the limbal type of vernal catarrh.

The sulfathiazole was stopped and adrenalin drops given. The eye responded rapidly and was soon entirely white. About two weeks later the patient again had some burning of the right eye and used some of the sulfathiazole ointment. This resulted in a violent conjunctival reaction which lasted two days.

In the hope that her sensitivity was due only to the sulfathiazole a sulfanilamide ointment having the same base was used. There was no reaction from this, and the blepharitis finally cleared up entirely.

#### LYMPHOMA OF THE ORBIT

DR. J. WESLEY MCKINNEY reported the case of Mrs. R. L., aged 49 years, who was seen in January, 1942.

The upper lid of the left eye had been swollen for several weeks and was slightly red. The vision was normal in each eye with correction. The eyes were internally normal. Both upper and lower lids of the left eye were full, but no masses were palpable. There was a dusky-red mass beneath the conjunctiva in the lower fornix and extending around to the nasal portion of the upper fornix. The mass appreciably elevated the fornix over its entire extent. Two small vegetations below the lower punctum were separate from the main mass. There was no exophthalmos.

General examination including blood study was negative. A small piece of the

mass was excised for biopsy. Under the microscope, the tumor consisted entirely of lymphocytes with little or no supporting tissue and no evidence of malignancy. The pathologic diagnosis was lymphoma. The patient was given X-ray therapy, which caused gradual disappearance of the mass.

#### EXOPHTHALMOS

DR. ROBERT RASKIND (by invitation) reported that W. W., a Negro aged 24 years, was admitted to the John Gaston Hospital on August 26, 1943, after having sustained a craniocerebral trauma under unknown circumstances. Examination on admission revealed a temperature of 100° F., pulse 68, respiration 20, and blood pressure 142/98. The patient was irrational and somewhat restless. There was considerable chemosis of the lids of the left eye and surrounding tissues. There seemed to be no loss of motor power of the extremities, and the deep tendon reflexes were physiologic and bilaterally equal.

X-ray examination of the skull revealed a fracture of the left frontal bone, involving the left frontal sinus and the floor of the left anterior fossa. Examinations of blood and urine made on the day following admission, except for a leukocytosis of 15,300, were well within the limits of normal.

The day after admission, there was more edema of the conjunctiva of the left eye; the proptosis of the globe had increased, and some corneal desiccation was evident. Attempts at closing the lids with collodion seal met with failure. Accordingly, on September 3d, Dr. Phil Lewis performed a Wheeler tarsorrhaphy under local anesthesia to prevent a desiccation keratitis.

On August 30th the patient was found to have a right hemiparesis with hyper-

reflexia and Babinski, but no clonus. The motor portion of the fifth, seventh, and ninth cranial nerves was involved on the same side. The picture of mental confusion and delirium became worse and the patient required heavy sedation. There was no hypertension, bradycardia, or slowing of respiration. Auscultation of the cranium revealed no bruit.

Since the patient's neurologic signs were becoming slowly worse it was decided to explore the left anterior fossa. Accordingly, on September 4th, under pentothal, an osteoplastic flap was turned down in the left frontal region. A moderately large extradural hematoma was encountered and removed; no active arterial bleeding interfered with this removal. The fracture of the roof of the orbit was visualized. The structures in the region of the sella turcica were inspected; the internal carotid artery was visualized; no aneurysm was found. The frontal lobe itself was quite tense, and it did not seem feasible to attempt decompression or exploration of the orbit at this time.

The patient made a very prompt and uncomplicated recovery following operation. The mental status was markedly improved within 48 hours. The contralateral pyramidal-tract signs disappeared more slowly. The patient was discharged from the Hospital on the thirteenth postoperative day, improved. Although the lids were still closed, the left eye seemed to have receded somewhat. On October 1, 1943, Dr. Phil Lewis opened the lids of the left eye. The eye was found to be in good condition.

*Comment.* Unilateral exophthalmos following cranial trauma is not an unusual finding in a neurosurgical service of any size. The most common cause of this manifestation is a fistulous communication between the internal carotid artery and the cavernous sinus. An excellent re-

view of the literature on this subject has been made by Meyer and Sugar. Additional case reports are provided by Cunningham and Daily and associates. These authors describe both the orbital and the intracranial pathology.

Occasionally, unilateral protrusion of the eyeball may be observed following trauma which produces luxation of the globe itself. This is more commonly seen as a birth injury and is described by Lloyd. The same author also mentions the presence of hematomas occurring between the bone of the orbital roof and the periosteum as another cause for proptosis. This condition is often associated with multiple petechial hemorrhages over the convexity of the cerebral hemisphere.

There are several methods of approach to the orbit and surrounding structures for decompression and exploration. The first has been described by Naffziger. It consists of a coronal skin incision with anterior reflection of the skin flap. Small bone flaps are then turned down in the frontal regions with their bases hinged on the temporal muscles. Dandy attacks the orbit through a small osteoplastic flap placed low in the frontal region, using the temporal muscle as a base. A type of decompression of the medial wall of the orbit (lamina papyracea of the ethmoid bone) carried out through the frontal sinus is described by Kister. This procedure is primarily for decompression and provides very little room for exploration. The first two methods also give an approach to the internal carotid artery and surrounding structures.

#### PITUITARY DISEASE RESEMBLING LAWRENCE-MOON SYNDROME

DR. E. C. ELLETT presented J. W., aged 14 years, who was seen in May, 1943. It had been noticed that he had recently been holding reading matter close to his eyes. He complained of some pain over his

eyes. The boy was overweight, suggesting the Lawrence-Moon syndrome, but there was no retinitis pigmentosa, mental deficiency, hypogenitalism, nor polydactylism.

The vision was 6/60 and J6 in each eye, unimproved with glasses. The optic nerves were atrophic. The visual field of the right eye showed a temporal defect, that of the left a moderate contraction with enlarged blind spots. The patient was referred for general physical and neurologic examination, and a diagnosis of pituitary disorder was made. Surgery was suggested but the patient did not return for two months, at which time the vision had failed completely. Operation was performed and the following observations were made: The brain was under markedly increased tension. The optic nerve of the right eye was compressed. A small portion of the cyst was visualized. When this was punctured a large amount of fluid escaped. A low right frontal flap was turned down according to Dandy's technique. The cyst was exposed and punctured. Two or three small bits of tissue were removed for biopsy. At the end of the procedure, there was a hole about 2 by 3 mm. in the cyst, from which some fluid was still draining. Routine closure was made. The sections were composed mainly of bundles of connective tissue with scattered small and elongated nuclei, surrounded by scanty cytoplasm. The nuclei were easy to identify as those of fibroblasts. In this connective tissue there was a single island of epithelial-like cells very poorly stained, which suggested (in view of the origin of the tumor) the chromophobe cells of the pituitary. Another part of the section revealed only calcified tissue.

#### OCULAR INJURY

DR. E. C. ELLETT reported that C. J., a 15-year-old boy, was seen in July, 1928,

the day after he had been injured by the explosion of a dynamite cap. There were multiple wounds of the legs, body, and face, and of both eyes. Small foreign bodies removed from the skin were non-magnetic.

Examination of the left eye revealed a conjunctival wound, out from the cornea, which had been closed soon after the accident. Apparently there was a scleral wound beneath. The vitreous was occupied by hemorrhagic bands passing in from the site of the wound. The fundus was dimly seen, with hemorrhage below, and out from the macula was a white area with a dark center, and a typical Vossius ring was present. The vision was first tested some days later and was 20/25 with +1.50D. sph. Ten days after the injury the eye and orbit became inflamed and the vitreous assumed a yellow look. A granuloma developed at the site of the scleral wound, and the vision was reduced to perception of moving objects. Pus escaped through the granuloma and the eye became shrunken. It was removed on October 18, 1928. The section of the eye did not show any foreign bodies.

Examination of the right eye revealed a wound in the cornea, 4 mm. in size, at the 12-o'clock position, and below this a narrow coloboma in the iris, probably a cut. The pupil dilated well, showing a superficial cloudiness of the lens in the coloboma, and a Vossius ring. The vitreous was cloudy, the fundus details were dim. The vision, when tested for the first time, was 20/40. A gray mass could be seen well forward in the vitreous at the 9-o'clock position.

Twelve years later, in August, 1940, the patient was seen again. The vision was reduced to 1/60 due to an opacity in the lens. Removal of the lens was advised, but the eye became sore in a few days and X-ray examination showed a foreign body in the eyeball. An acute

iritis developed which did not subside under treatment.

On September 24, 1940, a small yellow nodule was seen in the iris at the 9-o'clock position. The tension was normal. The eye continued to be irritated and on October 3d an iridectomy was performed, removing the nodule with a piece of the iris. A second small nodule appeared from behind the iris and was removed. The eyeball collapsed, following an escape of fluid vitreous, but its contour was restored by filling it with saline solution. The lens was not disturbed. An X-ray picture of the nodule that had been removed showed that it contained a metallic foreign body. On October 15th the vision was perception of fingers at 3 feet. The lens had become dislocated into the anterior chamber. The fundus was visible with +8.00D. sph. The vision was 6/60 with +11.00D. sph. On October 17th the lens had fallen into the vitreous. Two months later the vision was 6/18 with +12.00D. sph. The fundus was visible and the lens could be seen below.

The patient was seen again on January 29, 1944. The eye was white, the tension normal. The fundus was easily seen; there was a large coloboma. The vision with glasses was 6/9 and J4. The lens could be seen far below and it did not move with movements of the eye.

#### BLINDNESS FROM PITUITARY DISEASE

DR. E. C. ELLETT reported the case of M. A., aged 23 years, who was seen in October, 1943. He complained that his vision had been failing for three years, without apparent cause. He gave a history of some stomach trouble and kidney disease. The vision was R.E. 5/60; L.E. 5/20 (eccentric); it continued to diminish until in January, 1944, he was blind in both eyes. The optic nerves were atrophic. Neurologic examination showed nothing of significance, the spinal punc-

ture was negative, and it was thought that surgery was not indicated. It was felt, however, that the X-ray study was suggestive and that the symptoms were sufficient to justify X-ray treatment of the pituitary region. As a result the vision in the left eye improved to 5/60. The right eye did not improve.

#### TUMOR OF THE IRIS OF UNCERTAIN NATURE

DR. E. C. ELLETT reported that J. L., aged 23 years, had been referred from one of the Army hospitals for an opinion in regard to a black growth on the iris of the right eye. This had been present as long as the patient could remember, and was seen in a photograph taken nine years ago. The growth was near the root of the iris, was about 4 mm. in diameter, and projected forward. It was very dark and apparently separated from the iris tissue. The eye was otherwise normal. The vision was 6/6. The tension was 18 mm. Hg (Schiotz). The growth had previously been diagnosed sarcoma, and removal of the eye was advised. It did not appear to be of that nature, and the patient was advised not to have anything done.

#### COLORADO OPHTHALMOLOGICAL SOCIETY

February 19, 1944

DR. C. A. RINGLE, *president*

#### CLINICAL MEETING

(Presented by the Eye, Ear, Nose, and Throat Section, Fitzsimons General Hospital, Denver, Colorado)

#### QUADRANTANOPSIA FOLLOWING ACCIDENT

LT. COL. ROBERT A. SMITH presented R. M. T., aged 19 years, who was injured in an automobile accident on December 8, 1943, following which he was unconscious

for eight days. No record was available to show the extent of the injury or the surgical procedure which followed. He was admitted to this Hospital on February 7, 1944. He complained of visual disturbance, defective hearing, and nervousness when in crowds.

Physical examination had been essentially negative except for exaggeration of the deep and superficial reflexes. A tentative diagnosis was made on his ward of psychoneurosis, anxiety state, post-traumatic.

The vision was R.E. 20/20; L.E. 20/20. The pupils were equal and reacted normally to light and accommodation. The fundi were normal. On examination a bilateral quadrantanopsia of the upper visual field on the left side was elicited. The lower margin of the quadrantanopsia was not perfectly straight and fell below the 180-degree meridian, which was somewhat suggestive of a cortical lesion.

The patient stated that following the accident, he had bleeding from both ears, and that he had noticed some hearing difficulty and a hyperacusis. The ear drums were healed and intact but appeared dull and showed some scarring. His audiometric loss was: right ear, 16 percent; left ear, 4.8 percent.

Neurosurgical consultation had not been made as yet. The diagnosis from the ophthalmologic standpoint was quadrantanopsia, upper left field, bilateral. The cause was undetermined.

#### INJURY TO NASOLACRIMAL APPARATUS

LT. COL. ROBERT A. SMITH presented J. H. H., aged 22 years, who stated that he had had occlusion of the right nasolacrimal apparatus since 1935. He gave a history of having been hit on the right side of the nose by a wrench. The only evidence of the surgery which was performed was a small slit of the lower canaliculus of the right eye. In 1941 he

experienced more trouble than usual, evidenced by marked epiphora and a chronically inflamed right eye.

He was transferred to this Hospital on February 4, 1944, and a diagnosis of chronic, nonsuppurative, severe dacryocystitis of the right eye was made. The cause was undetermined. On February 12th a dacryocystorhinostomy was performed under sodium pentothal anesthesia supplemented by local novocaine. On February 13th the tear sac was irrigated through the lower canaliculus, and the solution flowed freely into the nose. The next day the skin sutures were removed. The sac was again irrigated and this was repeated daily for the next few days.

#### TRAUMATIC CATARACT

LT. COL. ROBERT A. SMITH presented H. A. S., aged 33 years, who was struck in the left eye by a flying particle from a booby trap on October 2, 1943. He was treated in an Army hospital immediately and was transferred to this Hospital on January 12, 1944.

The vision was R.E. 20/15; L.E. 6/200. There was a traumatic cataract, involving chiefly the anterior lens capsule; and there was an iridodialysis extending from about the 10- to the 12-o'clock position at the iris root. The iris opposite the iridodialysis was adherent to the anterior lens capsule by posterior synechiae, which would make surgical repair of the iridodialysis impracticable.

This case was presented for consideration of the advisability and method of procedure for cataract extraction.

#### PENETRATING WOUND OF THE CORNEA

LT. COL. ROBERT A. SMITH presented F. H. S., aged 23 years, who gave a history of injury to the left eye on February 3, 1944, as he was attempting to make an imitation bomb out of a "dud,"

50-caliber bullet. When the cap exploded something struck him in the right eye, causing a penetrating injury which involved the cornea and sclera, at about the 4-o'clock position, with prolapse of the iris. The prolapsed iris was excised and the laceration covered with a conjunctival flap. He was given sulfanilamides and three intravenous injections of triple typhoid, the first two of 200,000,000 units each and a third one of 400,000,000 units.

On February 11th the eye became chemotic and painful, so the patient was transferred to this Hospital. On examination, the conjunctival flap covered the wound, and the entire conjunctiva was edematous. The cornea and anterior chamber were clear. There was an iridectomy opposite the wound and an iridodialysis from the wound to about the 7-o'clock position which had a free edge and was attached to the anterior lens capsule, almost across the middle of the lens. The patient was placed on salicylates and intermittent hot packs. Under this treatment the eye improved and the patient became more comfortable. On February 14th the suture holding the conjunctival flap was removed. The following day the eye was examined with the slitlamp, and the aqueous was clear.

#### GUNSHOT WOUND OF THE RIGHT EYE

LT. COL. ROBERT A. SMITH presented H. S. R., aged 24 years. This patient was admitted to this Hospital on September 8, 1943. He reported that on August 31, 1943, when he was training some men at skeet shooting, he was accidentally shot. Two pellets struck him in the left hand and one in the right eye. He was taken to a hospital in Texas, where X-ray examination revealed an intraocular foreign body. Attempts to remove it with the electromagnet proved that the foreign body was nonmagnetic. He was treated

with intravenous typhoid therapy and was placed under observation.

On September 8, 1943, he was transferred to this Hospital. Examination revealed a markedly inflamed right eye, with the port of entry of the foreign body at about the 4-o'clock position on the limbus. The lens was slightly cloudy, and the fundus could not be seen because of hemorrhage in the vitreous. The foreign body was a round shotgun pellet that was imbedded in the lens behind the iris at the 10-o'clock position. The vision R.E. was limited to light perception; L.E. 20/20. It was decided to attempt to save the eye, but lens extraction was considered inadvisable because of the vitreous hemorrhage.

The following day the lead pellet was removed under local anesthesia, and convalescence was slow but uneventful. The lens became distorted, and the iris had defects at both the port of entry and at the site of extraction, and was bound down by posterior synechiae around its entire pupillary border. Vision was limited to rather poor light perception, and the eyeball was soft. Heterochromia was present, but slitlamp studies showed that the aqueous was clear and the iris free of any nodules.

The case was presented to get the opinions on the possibility of sympathetic ophthalmitis at this late date or in the future.

#### INTERESTING ANATOMIC PROBLEM

MAJOR MEYERS DEEMS reported the case of A. L. H., aged 26 years, who, on December 31, 1943, developed a fullness in his left ear. Four days later he awakened with a paralysis of the left side of the face and an eruption of the left ear canal and part of the concha.

He was transferred to this Hospital on January 8th, and on examination it was found that he had complete paralysis of

the left side of the face, and a herpetic eruption of the ear canal and a portion of the concha; he also complained of a dry eye.

A diagnosis of Hunt's syndrome was made, the pathology of which is a herpetic lesion involving the geniculate ganglion. The point of interest to the ophthalmologists was the dry eye and its cause. It is well known that a lesion of the seventh nerve, proximal to or involving the geniculate ganglion results in a dry eye, and that a lesion distal to the geniculate ganglion results in normal lacrimation.

What is not well understood is how the motor-secretory fibers reach the lacrimal gland from the seventh nerve. These fibers enter the seventh nerve with the pars intermedius and leave the seventh nerve at the geniculate ganglion, with the greater superficial petrosal nerve joining the vidian nerve in the region of the sphenopalatine ganglion. These motor-secretory fibers join the second division of the fifth nerve and proceed forward as a part of the zygomaticotemporal nerve. From this nerve, they proceed upward to join the lacrimal branch of the first division of the fifth nerve and, thence, to the lacrimal gland.

The patient's paralysis cleared up gradually and, with it, normal function of the lacrimal gland returned.

#### EPISCLERITIS

MAJOR MEYERS DEEMS presented a soldier, aged 21 years, who reported to sick call December 27, 1943, and was then transferred to this Hospital. The patient stated that in March, 1940, he had been ill for five weeks with an undiagnosed fever. At about the end of the second week both eyes became reddened and painful and for several days he complained of double vision. No other ocular symptoms were mentioned and his

vision was normal as far as he could remember. He stated that his vision upon induction was R.E. 20/20; L.E. 20/30. His eyes had remained reddened since the onset of his difficulty. His most constant complaints were a sense of scratching in his eyes, pain behind the eye, and mild photophobia and tearing. He stated that these symptoms were more pronounced in the left eye.

His past history was negative, with no symptoms of allergy or tuberculosis. Family history was negative.

In November, 1943, he suddenly noticed black spots floating before his eyes and his vision became cloudy.

On admission to the Hospital his vision was 20/50 in both eyes. The cornea, aqueous, and lens was clear in each eye. The vitreous was markedly cloudy, more in the right eye than the left. There were fine vitreous opacities in both eyes, and those in the right eye were larger and coarser. There was marked injection of the episcleral vessels bilaterally. The discs and fundi were normal. The tension was normal to palpation.

An unsuccessful search was made for foci of infection and 200,000,000 units of typhoid vaccine, given intravenously, did not clear up the episcleral injection. He was treated daily in the clinic with glycerine-fuchsin solution, applied topically, and zinc; the pupil was kept dilated with atropine. Smears of the conjunctiva were negative for eosinophilia and skin tests revealed nothing of significance.

#### TUBERCULOUS CHORIORETINITIS

DR. GEORGE H. STINE presented the case of T. L., aged 20 years, who had been discharged from the Army after a year's treatment because of bilateral chorioretinitis of a moderately severe degree. The etiology was undetermined. The patient's father had died of pulmon-



ary tuberculosis at the age of 33 years, and three uncles were similarly afflicted.

Examination of the eyes prior to this time revealed healed, disseminated, markedly pigmented chorioretinitis in both eyes, with some involvement of the maculas. The right eye became reactivated in December, 1943. No positive physical findings were elicited.

When seen for the first time in January, 1944, the vision, with a moderate correction for myopia, was R.E. 0.9; L.E. 1.0. The anterior segments of the eyes were normal. The fundus of both eyes showed many small areas of atrophic, pigmented choroiditis, with considerable pigment in the macular areas. In the left eye there was a diffuse hemorrhage which was faintly seen around the nasal margin of the disc and which was apparently in the choroid. Since then exudate had developed at and adjacent to the upper nasal margin of the disc. The lesion resembled chorioretinitis juxtapapillaris. There was also a faint superficial choroidal hemorrhage in the upper portion of the fundus. The intracutaneous test with second-strength purified protein derivative (P.P.D.) gave a marked positive local reaction with some general reaction, consisting of fever and malaise, in the first 24 hours. No other signs of active tuberculosis were found, although X-ray studies showed evidence of healed hilus tuberculosis. The patient seemed otherwise in good health.

Treatment consisted of atropine and X-ray therapy, one-fourth to one-third SED at five weekly intervals, and minute, gradually increased, doses of O. T. once a week, heliotherapy, and bed rest, with only moderate exercise. The condition began to show signs of improvement.

Walter A. Ohmart,  
*Secretary.*

## CHICAGO OPHTHALMOLOGICAL SOCIETY

March 20, 1944

DR. VERNON M. LEECH, *president*

CLINICAL MEETING

(Presented by the staff of the Illinois Eye and Ear Infirmary)

### GLIOMA OF THE RETINA

DR. E. F. KORTEMEIER presented the case of a girl, aged 17 years, who gave a history of increasing proptosis of the right eye of three years' duration preceded by gradual loss of vision. The right eye was blind, protruded about 15 mm., and the disc showed primary optic atrophy. X-ray examination of the orbit and optic foramen showed negative findings. The right orbit was explored through the temporal fornix and a spindle-shaped firm mass was found, surrounding the optic nerve and measuring 10 by 25 mm. The optic nerve was sectioned flush with the wall of the eyeball and the mass removed by blunt dissection. The histopathologic diagnosis was glioma of the optic nerve. There was no evidence of recurrence after eight months. The eye had fairly good motility and the retinal vessels were filled with blood.

### COATS'S OR VON HIPPEL'S DISEASE?

DR. MORRIS PIES presented J. W., a 14-year-old boy, with a history of blurring of vision of the left eye for one week. Family and past history were non-contributory. The vision was R.E. 20/40, corrected; L.E. light perception with faulty projection. Both eyes showed normal anterior segments. The fundus of the right eye showed hazy disc margins with enlarged vessels on the disc. Below and temporally to the disc there were areas of preretinal scar tissue with vascularization loops. The vessels were also

enlarged nasally, leading into a reddish elevated lesion in the periphery. The fundus of the left eye showed a large retinal detachment, with no visible tear, but massive subretinal exudation sprinkled with cholesterol. Neurologic and complete laboratory examinations gave results within normal limits. The case was presented to illustrate the difficulty in establishing a diagnosis between Coats's and Von Hippel's disease.

#### NEOPLASM OF THE CILIARY BODY

DR. M. A. DA SILVA presented a man, aged 74 years, who complained of gradual loss of vision for six years, and for three years pain in the left eye, which had become more pronounced in the past month. The left eye showed a scar from a pterygium operation. A well-defined pigmented mass, globular in shape, arose from the angle of the anterior chamber from the 9- to the 3-o'clock position, and a deposit of pigment was present on the iris in the neighborhood of the tumor. On transillumination the area corresponding to the upper nasal quadrant of the ciliary body was opaque. Three millimeters from the limbus, at the 9- and the 12-o'clock positions, two well-defined pigment spots were noted on the sclera; the one at the 12-o'clock position corresponded to the exit of an anterior ciliary vein. The pupil did not react to light or accommodation. The lens showed a nuclear cataract; the fundus was not visible. The intraocular pressure was moderately elevated. General examination and routine laboratory tests were essentially negative.

#### TUMOR OF THE ORBIT

DR. A. PERRET presented a 15-year-old girl who complained of protrusion of the right eye of two weeks' duration, which had developed within 24 hours. At the age of eight years she had been struck on the

right temple; exophthalmos of the right eye appeared in a few hours, but disappeared gradually in one month without any treatment. The left eye was normal. Vision of the right eye was 20/40. There was a suffusion of the lower lid. An orbital mass, giving the sensation of a pack of worms, was palpable through the nasal half of the lower lid, protruding from the orbit. The fundus was normal; its lower portion was 2 diopters more hyperopic than the upper. The veins were slightly tortuous and dilated.

There was a marked irreducible proptosis (13 mm.) with limitation of movements in every direction, and corresponding diplopia. The exophthalmos did not increase when the patient bent over. Auscultation was negative and X-ray studies of the orbit showed no deviation from normal.

The sudden onset suggested a hemangioma. The patient was referred to the Tumor Institute for a therapeutic test with irradiation. She had 14 sessions of irradiation treatment, and the eye receded 7 mm. Biopsy through the lower fornix was contemplated if the eyeball did not continue to recede.

#### DIABETIC RETINOPATHY WITH RETINITIS PROLIFERANS

DR. A. PERRET presented a woman, aged 34 years, who complained of seeing spots and black veils before the eyes, associated with poor vision, for the past year and a half. Diabetes was discovered four years previously and had been treated very irregularly with insulin and diet. At the present time the vision was R.E. 11/200; L.E. 10/200. Both eyes showed some early sector-shaped lens opacities and perinuclear deposits. No loose pigment was present in the anterior chamber. The fundi showed vitreous hemorrhages, severe retinitis proliferans, and diabetic retinitis.

The blood pressure in the brachial artery was 160/110. The urine contained albumen, sugar, and acetone. The fasting blood sugar was 222 mg. The tuberculin reaction with P. P. D. was strongly positive.

#### BILATERAL CONGENITAL COLOBOMATA

DR. WILLIAM BUSBY presented the case of C. S., a girl, aged  $8\frac{1}{2}$  years, who had been under observation at the Clinic since the age of four months. Family and past histories were non-contributory.

Examination showed a horizontal nystagmus of both eyes with greater amplitude in the left. Vision was R.E. 20/70; L.E. sufficient only to count fingers at 2 feet. The fundus of the right eye showed a deep depression in the lower part of the optic disc. The left eye presented a coloboma of the iris at the 6-o'clock position, a large bluish-white coloboma of the choroid, and a coloboma of the lower half of the optic disc. Visual fields were not obtainable.

#### GUMMATOUS RETINITIS

DR. DAVID HORWITZ presented M. S., a Negress, aged 38 years, with a history of blurring of vision of the right eye dating from 1920, at which time she had contracted syphilis. Visual acuity of the right eye had previously been improved by vigorous antisyphilitic treatment. The vision at this time was R.E. 20/200; L.E. 20/20. A large, slightly elevated white retinal infiltration was present slightly nasal to the disc of the right eye and there was evidence of anterior uveitis. There was no improvement under arsenical therapy, and a secondary glaucoma developed. The intraocular pressure fell to normal within one month. In the fundus there appeared a large yellowish lesion along the superior nasal vessels. Clinical impression was that of gummatous retinitis. After one month of treatment with 90 grains of

potassium iodide daily, visual acuity improved to 20/40+4, and the lesion in the fundus had become well demarcated and quiescent. There was also complete subsidence of the anterior uveitis.

#### FIBROPLASIA

DR. BEULAH CUSHMAN presented the case of Baby D., from the Clinic of Northwestern University Medical School. This was a premature baby whose birth weight was 1 lb., 12 oz. She had been in the incubator for 11 weeks and had gained satisfactorily. She had had no ultraviolet treatments. When the baby went home the parents noticed that the eyes seemed small.

She was brought in for examination at the age of 5 months, weighing 13 pounds; with the history that the eyes followed light or looked toward an electric light. They had never been injected and there was no tearing.

On examination, the cornea of the right eye measured 8.0 mm. and appeared round; the anterior chamber was very shallow with the thin iris lying forward almost in contact with the cornea. The slightly irregular pupil was 3.0 mm. in size, and there was no reaction to light. No definite pupillary membrane could be discerned. The lens was clear, and an avascular grayish mass was visible behind the lens, with no free masses.

The cornea of the left eye was slightly larger, measuring 8.5 mm., and was round and transparent. The anterior chamber was slightly deeper. The pupil measured 3.0 mm., with no reaction to light. The lens was clear, and a grayish reflex, less extensive than that in the right eye, was seen posteriorly; it appeared to be a retinal fold. A red reflex was obtained in both eyes temporally. The condition was considered to be "fibroplasia," according to Dr. T. L. Terry's recent studies. The eye development seemed

to be that of about a 6½-months-old fetus.

Since the first examination the eyes have shown some changes with irregularity in the shape of the pupil and gradual overgrowth of the uveal pigment forming an ectropium uvea. At about five months of age the infant had begun to hold her fists over her eyes in a manner that seemed to indicate some irritation or light sensitivity.

Last October, Dr. Terry advised a trephining over the ciliary body of the right eye and this was done. The condition of the eye did not seem to change. The left eye remained the same.

The pathologic diagnosis was "fibroplasia," as described by Dr. Terry, who has stated that normal development of the eyes is interfered with by the premature birth. Mann has pointed out that an altered environment may cause the organizers or determinants of organs to produce their stimulus at the improper time. The mesodermal elements of the eye will develop since they are self-determining and their size is regulated by the presence of the optic vesicle.

#### OCCCLUSION OF THE CENTRAL RETINAL VEIN

DR. BERTHA A. KLIEN presented a paper on this subject which has appeared in this Journal (December, 1944).

*Discussion.* Dr. William A. Thomas said that from the standpoint of internal medicine one finds great similarity between occlusion of the central retinal vein and vascular occlusion elsewhere in the body; especially the cerebral and coronary vessels, since these three together constitute the main end arteries of importance.

Obstruction may occur from external pressure, such as tumors; however, this can be ignored, because the actual mechanism is within the vessel as the terminal

incident of the external disease. External pressure results in occlusion from within, a process not strictly mechanical. Treatment would depend on the cause of the mechanism involved; therapy quite appropriate for one type of occlusion is entirely inadequate or useless in other types.

It must be borne in mind that thrombosis is not a clot. Clotting is a very complicated process occurring only in the higher vertebrates and requiring complete stasis of blood, and tissue or cellular injury. It is like the slow freezing of a pond with uniform distribution of all elements involving vitamin K, bile salts producing prothrombin, and calcium resulting in thrombin. Thrombin is controlled by a delicately adjusted balance between antithrombin and thrombokinase. With fibrinogen it produces fibrin. Thrombosis is to be compared to a snow bank, with the platelets as the flakes. The blood must be in motion. Stained platelets are small nuclear bodies. *In vivo* this nucleus is surrounded by a veil-like cytoplasm with actively ameboid pseudopodia that are arrested by an irregularity of the surface and adhere to it and one another in ridges at right angles to the blood flow. The injured cells liberate thromboplastin, which forms a clot in the lumen extending to the lumen of the next larger vessel, where the blood stream is slowed. A thrombus is thus formed and this process may extend into parent vessels of ever-increasing size.

The causes of thrombosis are: (1) injury to the intima, which is traumatic; this is not important in the eye but is serious in the lower limbs and following surgery; (2) slowing of the blood stream; (3) change in chemical composition of the blood; (4) inflammation of walls, as tuberculous, and so forth. Slowing of the blood stream is very important with respect to anticoagulation therapy.

This may result from general conditions causing a low blood pressure. Thrombosis usually occurs at night. Hypothyroidism is frequently seen, as well as heart disease, causing a lowering of pulse pressure which is more important than the actual reading of the blood pressure. Shock, practically always surgical, is a common cause of cerebral thrombosis, and should be considered in connection with the retinal vessels. Hemoconcentration, increased blood viscosity, and decreased blood volume are all causes, since in any situation where the intima is touching, thrombosis will occur.

Hypertension, as such, is not important, since the disease is only in arterioles. But where vascular disease has occurred, with slowing of the venous blood flow and lowering of the venous pressure, thrombosis occurs as a stagnation phenomenon. When the large vessels only are sclerosed there is no hypertension, but nocturnal thrombosis is frequent.

Spasm of arterioles reduces flow in veins, especially in the spastic stage of hypertension. Thrombosis in arteriosclerosis and angiosclerosis is only the terminal event in the course of systemic disease, and anticoagulants are of no value.

Changes in chemical composition of the blood include numerous dyscrasias such as: (1) polycythemia vera, a defect of heparin production, which occurs in acute hepatic insufficiency; (2) an excess of vitamin K, occurring in inflammation of the liver with prothrombin levels of 150 or more; (3) increased platelet production and increased fragility of platelets. Calcium is not an important factor and thrombosis is not inhibited by withholding it or accelerated by administration of these salts.

Inflammatory conditions of the eye, such as thrombophlebitis, differ from

general disease in most other portions of the body such as the pelvis, or lower extremities, where they are most frequently seen in general medicine. In these latter cases accessory circulation is present and there is no great tissue suffering from loss of circulation.

Thrombi may become infected, causing abscess or pyemia. If aseptic they may contract with reopening of the vein, may absorb, or may organize with entering blood vessels. If calcium salts are deposited, they form phleboliths. Anticoagulants, such as heparin and dicumerol, prevent agglutination of platelets and interfere with the union of prothrombin and calcium in the formation of thrombin. The use of anticoagulants is important in general medicine, especially in trauma, surgery, and so forth.

In cases of slowing of the blood stream, general measures such as thyroid, digitalis, and antispasmodics are used. These are especially valuable in the hypertensive spastic conditions where the use of cyanites, nitrites, and so forth, may result in longstanding suppression of spasm. In these cases anticoagulants are of extreme value. On the other hand, if extensive arterio- and angiosclerosis result in external pressure to the vein, or thrombosis therein is a terminal event in general systemic diseases, anticoagulants are of no value.

In chemical changes in composition of the blood that shorten coagulation time and increase prothrombin levels, heparin and vasodilators are obviously indicated, and no time need be spent in elaborating upon this phase.

In inflammatory conditions, anticoagulants are in most cases useless and dangerous. In the central retinal vein, where inflammation, especially tuberculosis, has occurred, there is a tendency to hemorrhage and thinning of the vessel wall. A thrombus partly supports the wall. This is

seen in the strengthening of an aneurysm of the aortic wall by a thrombus. Any interference is likely to result in profound hemorrhage, so that in the eye anticoagulation therapy will probably result in aggravation rather than improvement of the vascular condition.

#### THE STANDARDIZATION OF SO-CALLED SCHIÖTZ TONOMETERS

DR. PETER C. KRONFELD presented a paper on this subject which has been published in this Journal (January, 1945).  
Robert Von der Heydt.

#### NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

March 6, 1944

DR. SIGMUND A. AGATSTON, *presiding*

According to its annual custom, the March meeting of the New York Society for Clinical Ophthalmology was devoted to a round-table discussion of a single ophthalmologic subject, namely "Ocular injuries." The meeting was divided into two parts: (1) demonstrations related to the evening's subject and (2) a panel discussion wherein questions submitted several weeks before the meeting were edited and then divided among the four ophthalmologists comprising the panel. The four ophthalmologists were: Dr. Morris Davidson, Dr. Wendell L. Hughes, Dr. Edmund B. Spaeth, and Dr. Harvey E. Thorpe.

#### THE BERMAN LOCATOR

MR. SAMUEL BERMAN demonstrated the Berman locator and showed how it may be used by the ophthalmologists.

#### THE OPHTHALMIC ENDOSCOPE

DR. HARVEY E. THORPE demonstrated the ophthalmic endoscope and described

its use in removing nonmagnetic foreign bodies from the eye.

#### GROSS SPECIMENS OF INJURED EYES

DR. EDWARD BURCHIELI presented a series of gross specimens of injured eyes.

#### PANEL DISCUSSION ON OCULAR INJURIES

*Question.* What is your feeling about the A.M.A. evaluation of percentage loss of visual acuity in eye injuries?

DR. DAVIDSON. Six states use the A.M.A. system of evaluation without qualification. The principle upon which it is based, that is, geometric progression in the relationship between the visual-acuity loss and compensation, is sound. A more consistent application of a geometrically progressive principle is in line with a world-wide tendency and consensus of opinion. However, it should be applicable only when based on a 25-percent relation of compensation for the loss of an eye to that for permanent total disability, and it should give due recognition for damages with better than 20/25 visual acuity. With these modifications, the A.M.A. recommendations are essentially sound.

*Question.* Discuss the immediate versus the late plastic repair in case of burns.

DR. HUGHES. In fire or steam burns of less than third degree, where there is damage of the surrounding deeper tissues, it is often impossible to tell whether the tissue will survive. Since some of the tissue will heal with a result as good as can be obtained through early grafting, palliative treatment is indicated unless the eye itself is threatened. Lid adhesions may be required to preserve corneal viability.

In burns from strong alkalis or acids it is difficult to make sure that all the tissue infiltrated by the chemical is removed. In a severe fresh burn of the conjunctiva

with expectation of extensive loss of tissue, mucous membrane may possibly be used at once, before swelling occurs. All injured tissue must be dissected from the bed where the graft is to be placed; one may err by removing too much or too little of the partially destroyed tissue. While the theory of immediate grafting is enticing, practical, conservative early treatment will yield the best functional and cosmetic results in most cases.

*Question.* What method do you employ in the plastic repair of an avulsion of the lower lid medial to the punctum lacrimale?

DR. SPAETH. The repair embodies three essentials: (1) the reattachment of the ruptured orbicularis fibers to a firm position; (2) the closure of the conjunctiva and skin and (3) rejoining the bore of the lacrimal canaliculus to the internal common punctum. The punctum is dilated, and a No. 2 Bowman probe is threaded through the canaliculus so that about 2 mm. of the probe appears in the end of the laceration. The cut lid angle is brought up to its normal attachment, and the probe passed through the common punctum into the lacrimal sac and thence down through the lacrimal-nasal duct. The probe is then bent at a right angle at the punctum, and cut off there after a second bend has been made within the lacrimal sac. This bend is just sufficient to hold the inner cut end of the lid margin in close approximation without tension upon the canaliculus. Tension results in a slough of the canaliculus. Two sutures are then placed, one on the posterior surface and the other on the anterior surface of the lid close to the lid margin, mattressed from side to side, across the line of laceration and tied. Other sutures are placed as necessary for closure subsequent to the catgut closure of the orbicu-

laris fibers, and in connection with any debridement that is necessary. The orbicularis fibers must be closed carefully to prevent a lid sag.

*Question.* What method do you employ for the removal of nonmagnetic intraocular foreign bodies, especially glass?

DR. THORPE. I do not believe I ever removed a glass foreign body that was totally intraocular. The method of removing a foreign body depends upon its location. If it is in the cornea, splinter-forceps may be used; and if it is within the layers of the cornea, one can cut down to it and pry it loose. For a foreign body in the anterior chamber, make a keratome incision and attempt to remove it with clot forceps. When the foreign body is in the angle of the anterior chamber the situation is less simple; the foreign body may not be visible, and the diagnosis is made by Vogt's skeleton-free X-ray method or by means of the gonioscopic contact lens. The foreign body is dislodged from the angle by means of forceps or may have to be dislodged with a hook. If it is caught in the iris it may be disentangled from it, although this usually cannot be done, and an iridectomy must be performed in that segment of the iris containing the foreign body. A foreign body of this type in the lens of a person over 45 years calls for an intracapsular extraction; this is not possible in younger people, on whom a loop extraction is performed. A foreign body in the ciliary body requires accurate localization, for this X ray with a Comberg lens is best, and it locates the proper meridian to dissect; the foreign body may then be extruded into the incision or can be felt and then removed. A nonmagnetic foreign body in the vitreous is removed preferably through an incision in the pars plana by means of a fine forceps under ophthal-

moscopic visualization; if the lens is cloudy and ophthalmoscopic visualization impossible, the incision should be made after the most accurate localization possible. One should try to see the foreign body by intense transillumination through the pupil and remove with forceps. If neither of these methods for removing the intravitreal foreign body is feasible the ophthalmic endoscope should be employed.

*Question.* How do you compute schedule percentage of disability following trauma in a claimant who developed a partial stationary lens opacity, reducing vision to 20/70 and who has faulty depth perception?

DR. DAVIDSON. Experience shows that faulty binocular depth perception cannot be caused by reduction of visual acuity of one eye to 20/70, regardless of the cause. If found to be present, the cause of the faulty depth perception must be sought for in a disturbance of the binocular motor apparatus, either the result of injury or preëxisting, and dealt with accordingly.

*Question.* In injuries of the cornea, what are the indications (A) for direct corneal suturing, and (B) for the use of conjunctival flaps?

DR. HUGHES. (A) No sutures are required in the case of tiny corneal injuries. Direct corneal sutures are required in: (1) nonpenetrating oblique wounds into the stroma when the superficial edge is likely to be displaced; (2) penetrating lacerations 2 to 5 mm. long that do not gape too much—mattress sutures give better support than single sutures; and (3) extensive lacerations with complete or nearly complete detachment of a section of the cornea.

(B) Conjunctival flaps are indicated in

most extensive corneal lacerations. Corneal sutures retain firm holding power not longer than three or four days and the conjunctival flap provides additional support.

*Question.* How can one avoid notching of the lid margin in suturing the lid after injury?

DR. SPAETH. As much skin, orbicularis, and tarsus as can be saved must be saved. Cicatrices in the superior cul-de-sac are usually the result of faulty closure there, and those connected with the tarsus are even more responsible for lid-margin notching than is faulty skin closure. A laceration in the lid which involves the levator to any great extent must be closed meticulously in the superior cul-de-sac, because the unopposed contraction of the lateral horns of the levator may separate the edges of the vertical laceration and permit the introduction of interposed tissue, with a resultant fullness of the upper lid and ptosis which could otherwise have been prevented. The conjunctival cul-de-sac and the tarsal plate up to the lid margin are closed through an external approach with 5-0 catgut, the edges being approximated accurately and according to the pattern of the laceration. The orbicularis fibers are then picked up and closed with catgut in a separate suture line offset somewhat from the line in the tarsal plate. The closure of the skin and lid margin is now the final step. At the edge of the laceration on the lid margin of the tarsus, two very tiny tongues are cut, each about  $1\frac{1}{2}$  mm. in length, and including all the tissue of the lid margin beyond the line of lashes. The lashes are closely trimmed at that point. Crescentic excisions are made in the skin surface and the first suture is placed at the lid margin through the tarsus only in such a way that the two tiny tongues of tissue



formed there are made to pout. This suture is of 5-0 catgut. Immediately above that, one introduces the first black silk skin suture, and the rest of the skin is closed with interrupted black silk sutures. After full healing, if there is any protuberance there, it can be readily wiped off with the actual cautery.

In general one should try to break up the line of vertical scars that are already present. Resection and subsequent closure for fresh injuries are frequently not sufficient. It is, therefore, wise to interpose a Z plastic of skin and long orbicularis fibers for the correction of a notching already present. All this is fruitless, however, unless tarsal deformities are simultaneously corrected. The V-Y plastic is frequently of use for the correction of lid-margin notches following minor injuries especially in the lower lid.

*Question.* Outline your routine for the removal of intraocular magnetic foreign bodies and indicate (A) choice of anterior and posterior routes (B) what precautions do you take to prevent retinal detachment?

DR. THORPE. (A) The corneal wound is outlined by means of fluorescein and the anterior chamber is restored with normal saline. If the foreign body is in the anterior chamber, the hand magnet is used to draw it into the incision. It may be necessary to depress the lips of the wound, but the magnet is not inserted into the anterior chamber, for this may cause cataract. If the foreign body is in the iris, an incision is made in the same region and an attempt is made to disentangle it with the magnet; if this is not possible an iridectomy is performed. An intralenticular foreign body may be permitted to remain until the lens becomes cloudy. It is difficult to remove very small foreign bodies from the lens. Sometimes the giant magnet will drag the foreign body back

through the route of entrance and leave only a small wound. The usual method followed is to open the capsule and use a giant magnet to bring the foreign body into the anterior chamber. In the case of a very small foreign body, while there is a possibility of its being lost in the attempt at removal, an intracapsular lens extraction is performed. For a foreign body in the ciliary body, the pupil is dilated maximally, and the magnet applied obliquely to pull the foreign body through the pupil. If it hits the iris, which can be seen to bulge, the pull is made still more oblique to avoid entanglement. If the foreign body is located in the pars plana, the sclera is incised over it, two mattress sutures are inserted; the assistant pulls on the latter and the magnet is applied. For a foreign body in the vitreous near the wall of the globe, a radial incision should be made in the pars plana and the magnet applied. Instead of these incisions trephination, according to the method of Fralick, may be performed. It is best to pull foreign bodies in the posterior part of the vitreous or near the retina forward into the anterior chamber and treat them as anterior-chamber foreign bodies. A foreign body wedged in the sclera is removed by an incision between two mattress sutures which are pulled up; the choroid is incised and the hand magnet inserted just to that point; if it does not come out, the tip of a Lancaster magnet may have to be inserted into the vitreous. Although I have had little experience with the Berman locator, it has helped me determine whether the foreign body was magnetic and where it was closest to the sclera.

(B) A foreign body lodged in the retina is removed through a scleral incision; pulling it forward with the magnet may drag the retina forward with it. When a foreign body is to be removed through a scleral incision, first coagulate

the surface in the region of the planned incision.

*Question.* Should iridodialysis be treated surgically or not?

DR. HUGHES. In general, unless some definite cosmetic or functional advantage is to be obtained by operation, surgery is contraindicated. The feasibility of obtaining improvement in appearance or function must be considered in relation to the degree of disfigurement, the extent of the iridodialysis, the functional and visual disturbance, and the condition of the rest of the eye.

*Question.* How is loss of field compensated in the presence of normal central visual acuity?

DR. DAVIDSON. Compensation for loss of field in the presence of normal central vision, an extremely rare occurrence in civilian or industrial accidents—about 1 in 10,000 cases—is calculated on the basis of loss of one half of the field as the equivalent of 50 percent of the loss of an eye; and the central zone of 30 degrees as twice as valuable as the peripheral field. Sectors are dealt with accordingly.

*Question.* How would you handle a cut lid if ptosis intervenes?

DR. SPAETH. (A) Immediate treatment: Dissect sufficiently farther to permit uncovering of the cut edges of the levator and to reattach the latter by mattress sutures to the tarsus and superior cul-de-sac. It is entirely proper to extend skin lacerations so as to obtain sufficient exposure to accomplish this. Vertical lacerations lying close to the canthal angles, internal or external, will cause almost as much ptosis at that angle as may be seen in cases of horizontal stab wounds and lacerations. In addition, if such injuries are not properly closed primarily, the ptosis that results is a

greater cosmetic blemish than that resulting from a horizontal laceration wherein the resulting cicatrix has, to a certain extent, reattached the levator to the lid.

(B) Late treatment: The approach can be from the conjunctival or the skin surface, in that it is possible to resect cicatrices either from before backwards or the reverse. The levator fibers are isolated, secured with sutures, the cicatrices removed, the levator closed after reattachment vertically or horizontally, and the case handled as an ordinary ptosis procedure, except that a partial tarsus resection is usually necessary in addition.

*Question.* In what conditions is the hand magnet the instrument of choice in foreign-body removal?

DR. THORPE. The hand magnet is the instrument of choice for foreign bodies located in the anterior chamber, in the iris, in the pars plana of the ciliary body, and for those foreign bodies in the vitreous which are near the lateral walls of the globe, or for those that are larger than 2 by 3 mm. in size and have to be removed by incision either in the pars plana or in the scleral wall posterior to the ciliary body. The giant magnet is often used for small foreign bodies in the cornea, in the lens and for those located far back in the eye, and wherever increased strength is desired.

*Question.* Can the following lesions result from trauma to the head: (A) Keratitis; (B) Rupture of the iris or iris sphincter; (C) Cataract; (D) Detachment of the retina; (E) Rupture of the choroid; (F) Retinal hemorrhage?

DR. DAVIDSON. (A) Keratitis can be caused by a head injury which injures the fifth nerve or its branches and is usually accompanied by other intracranial-nerve injuries.

(B) and (C) I have never observed

these as a result of head injuries and doubt their possibility.

(D) Detachments of the retina can take place in eyes predisposed by degenerative lesions and previous intraocular injuries, such as contusions, intraocular foreign bodies, following head injuries in the same way that the last straw can break the camel's back. The head injury must be bona fide and a retinal tear observed within a very few days, and the detachment noted within two weeks, for other insults may cause it, too, in such predisposed eyes.

(E) I have never seen this and doubt its occurrence as a result of head trauma.

(F) Retinal hemorrhages rarely may be observed in head injuries that are followed by intracranial hemorrhages, particularly in the presence of fragile pathologic vessels or hypertension.

*Question.* How would you handle penetrating wounds with (A) Prolapse of tissue—iris, ciliary body; (B) Prolapse of vitreous; (C) Dislocation of the lens in the anterior chamber; (D) Foreign body of the cornea projecting into the anterior chamber?

DR. HUGHES. (A) One may replace a simple small prolapse of undamaged iris associated with a clean recent wound after cleansing and applying germicidal drops. Atropine or eserine keeps the iris away from the wound, depending on its location. Air is introduced and the head tilted so a bubble separates the wound from the underlying tissues, preventing synechiae. Sulfa drugs and possibly foreign protein are administered.

The exposed portion of a badly torn or macerated iris is excised and the remainder replaced. If the edges of the laceration are tightly approximated, air may be inserted. Corneal sutures or a subconjunctival flap may be necessary.

Extensive prolapse of the ciliary body

calls for enucleation. Small wounds in the ciliary region are watched carefully for sympathetic ophthalmia, regarding which the patient should be informed.

(B) Prolapse of the vitreous should be excised with scissors, the excess sponged away, and the wound closed with sutures.

(C) If the iris is intact, use eserine and keep the eye dependent to avoid losing the lens in the vitreous. When to remove the lens would depend on the nature, location, and extent of the original laceration and on numerous other factors in the condition of the eye itself, likelihood or presence of frank infection, and so forth.

At the operation itself, ultraviolet light to render the lens clearly visible is a real aid, especially if there is a possibility that the lens may drop posteriorly. The operation is best done with the head held on one side and the incision made to include the lowest portion of the limbus, so that the lens will have a tendency to come toward the wound by gravity.

(D) If magnetic, the foreign body should be removed with the magnet. If nonmagnetic one can often work under a corner of the object, often under guidance with the slitlamp, with a small, sharp-pointed instrument, and gradually tease it forward. If the foreign body cannot be removed through its wound of entrance, the wound may be enlarged or an oblique incision made for the removal. It may be necessary to protect the lens from the foreign body by using miotics or teasing the foreign body loose from the cornea with the point of an Agnew keratome before the chamber is lost. A blunt Tyrel hook is frequently useful in maneuvering a nonmagnetic foreign body from inside the anterior chamber. Every effort must be made to prevent losing it posteriorly through the pupil. The patient may need to be operated on with the head

sidewise to allow the object to gravitate toward a limbus opening.

*Question.* How would you handle a stab wound of the orbit with division of an extraocular muscle?

DR. SPAETH. Prevent paralytic ptosis, as already discussed. The immediate surgery of exploration and an attempt to rejoin the cut edges of an ocular muscle has, up to now, proved not too satisfactory. This has been anatomically accomplished on the external rectus, but the late paralysis has been just as marked as if it had been unsuccessful. This has probably been due to sectioning of the nerve. Traumatic laceration of the origin of the inferior oblique was sutured with good results in one instance and fair results in another. In two other cases surgical exploration showed the muscles to be cut so far back in the orbit that the attempts to rejoin the cut edges of the muscles were unsuccessful. It seems best to permit primary healing and thereafter correct the paralytic strabismus that results by means already known to us. Naturally, in these cases, one presumes that the globe has not been injured.

*Question.* (A) What has been your experience in cases presenting siderosis and what is the ultimate outcome after removal of the foreign body? (B) Can siderosis develop if the steel is extraocular, as in the orbit?

DR. THORPE. (A) Siderosis may commence one to 24 months after a foreign body is present. Siderosis depends on the chemical composition of the intraocular foreign body; some steel alloys do not produce siderosis. The onset is very slow in the case of an intralenticular foreign body.

In reference to ultimate outcome, I have not seen it clear up under the lens capsule after removal of the foreign body.

I have seen it clear up in the iris.

(B) I have never seen siderosis develop in an eye if the foreign body was extraocular.

*Question.* What are the distinguishing characteristics of an ocular contusion in retrospect?

DR. DAVIDSON. In the last war, Henri Frankel recognized the fact that the lesions of eye contusions are not haphazard phenomena indiscriminately affecting isolated structures of the eye, but constitute a definite syndrome. Its several signs result from the action of the lens which is temporarily subluxated because of the momentary distortion of the eyeball. There are, accordingly, lens lesions and iris pigment on the lens capsule, traumatic iridoplegia, and peripheral-fundus lesions. To these may be added two signs demonstrable only by biomicroscopy; namely, dehiscences of the pigment layer of the iris, manifested by diapupillary transillumination, and the presence of retinal pigment epithelium dispersed and enmeshed in the anterior vitreous. A preferable name for the syndrome would be anterior-segment contusion syndrome, and at least two of its signs are to be found in every case of ocular contusion as permanent sequelae. Contrecoup lesions of the posterior segment are observed in about one third of the cases in association with anterior-segment lesions and are conditioned by the vulnerability of the macula and perhaps by the anchorage of the optic nerve and the insertion of the inferior oblique muscle.

*Question.* How do you treat injuries of the ciliary body with respect to enucleation?

DR. HUGHES. Treatment of severe lacerations associated with protruding ciliary-body tissue has been discussed. After small penetrating injuries through

the ciliary body, irritation for more than two weeks or mutton-fat deposits on the posterior corneal surface call for enucleation. Recession of the near point of accommodation in the opposite eye in a short period of time, with increase of cells or reluctance of the beam, in the aqueous or retrolental space, makes enucleation imperative. In the first two weeks there is no urgency. After the first several months, the longer the interval after the injury the less the danger to the fellow eye. Nonsensitivity to uveal pigment, as determined by intracutaneous test, lessens the likelihood of development of sympathetic uveitis. This test requires 14 days and is of little value for an immediate decision. In general, in an injury to the ciliary body, lean toward enucleation.

*Question.* Discuss sympathetic ophthalmia in relation to: (A) Youth of the patient; (B) Size of the wound; (C) Prolapse of uveal tissue; (D) Nontraumatic cases.

DR. SPAETH. (A) Sympathetic ophthalmia seems to occur most commonly in younger individuals. It is certainly a common finding before the tenth year of life. It is a relatively much less common finding after the fourth decade, if the frequency incidence of injury and surgical procedures are taken into consideration, according to these same age groups. Computed on this basis, it shows sympathetic ophthalmia most common in the middle 20 years of life, next in the first 20 years, and least frequent in the remaining years of the average span of life. Under such circumstances it does seem as if advancing years give protection, to a certain extent, from sympathetic ophthalmia.

(B) The size of the wound is roughly related to its development, although several cases are on record of needle penetration with subsequent sympathetic

ophthalmia. On the other hand, the massive lacerations of explosive force is one of the most common causes for the development of the condition.

(C) Prolapse of the uveal tissue is not an essential for the development of sympathetic ophthalmia. Cases as seen following cataract surgery, following cyclo-dialysis, after an iridectomy for traumatic prolapse of the iris, seem to suggest that the mechanical factor necessary is injury to the uvea rather than prolapse of the uvea. Prolapse of the uveal tissue, however, will result in more injury to the uveal tissue with continued irritation. One can almost think of it as a summation of tissue insults, permitting us to say that prolapse of the uveal tissue probably results in a higher incidence of sympathetic ophthalmia than is the case when prolapse has not occurred.

(D) There has been some controversy in the literature relative to the development of sympathetic ophthalmia in nontraumatic cases. It is my opinion that trauma with perforation is a *sine qua non* for the development of sympathetic ophthalmia. This must include surgical trauma as well. I prefer considering the development of irritation in the fellow eye in the presence of a nontraumatic iridocyclitis of the first eye, an iridocyclitis probably from the same basic pathology and not one of sympathetic ophthalmia. Duke-Elder speaks very definitely of the necessity for injury and differentiates this from the sympathetic reflex irritation present in the fellow eye in association with disease in the original eye. An iridocyclitis that has progressed to phthisis bulbi has been said to give rise to sympathetic ophthalmia, but in such instances one again must be certain, in the absence of surgery to the iridocyclitis or the absence of perforation of the cornea, that the condition is not a parallel or coincident infection.

While the etiology of sympathetic ophthalmia is unknown it is almost certain that it is infective in origin, probably exogenous primarily, eventually becoming systemic, but exciting no symptoms, and is localized in the sympathizing eye because the uvea forms the only favorable nidus for its development. Allergic sensitization and development has also shown considerable experimental confirmation. Woods's conclusions are rather pertinent. They are to the effect that normal healing of a wound is associated with the appearance in the blood stream of antibodies specific to and for uveal pigment; that when protracted inflammation occurs, these antibodies do not appear; and further, when sympathetic ophthalmia appears, not only are these antibodies found to be lacking, but a cellular hypersensitivity for uveal pigment develops.

*Question.* Describe the technique for the removal of nonmagnetic intracorneal foreign bodies.

DR. THORPE. For foreign body on the surface of the cornea with an iron-rust ring: With a Graefe knife, or a knife needle, make a small incision just at the edge and pry the ring loose. If any small pieces break off and remain, curette the surface thoroughly. Some doctors prefer using a dental burr.

A foreign body located between the layers of the cornea, such as a piece of brass, is extremely difficult to remove. It is necessary to cut down on this foreign body, usually near one side of it. Get beneath it and try to draw it forward. A very useful instrument for removal of intracorneal foreign bodies is a fine watchmaker's forceps which has had fish-hook teeth put in with a fine saw. This will grasp the foreign body, and wood splinters will not slip off. The foreign body that penetrates into the anterior chamber has been adequately discussed.

Leon H. Ehrlich,  
*Secretary.*

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## SHALL WE NATIONALIZE MEDICINE?

Under this title Lord Horder, G.C.V.O., M.D., F.R.C.P., in an address delivered before the Cardiff (South Wales) Medical Society (British Medical Journal, March 17, 1945), raises a number of interesting questions as to the present movement in the direction of state medicine. "By nationalizing medicine," he says, "I mean doing with medicine what the Socialist desires to do with the land, the banks, the coal mines, and the railways—bring them under the control of the State." "This," he continues, "is equivalent to a whole-time State service for all doctors, and that is what I mean by 'nationalized medicine.'"

The speaker objects to the term "state medicine" as not free from ambiguity and to "socialized medicine" because "it may mean making medicine more accessible to the people; and . . . this may be done without nationalizing the medical profession."

We are reminded that "the fundamental note in the doctor's ideal is freedom. But what happens to our freedom," continues Horder, "if we are a part of a nationalized service? . . . I am speaking of our freedom as members of a profession. We must preserve 'free speech on medical matters, free criticism of medical affairs, and free publication of scientific work.' If medicine is nationalized it is to a large degree monopolized, it is stereotyped."

The sponsors of the British Government's "White Paper" on socialization of medicine have denied that the document envisages the beginning of a whole-time medical service. On the other hand, Horder points out that the British Labor Party has issued a brochure in which it is declared necessary "that the medical profession should be organized as a national full-time salaried, pensionable service." Sir William Beveridge, probably the chief author of the White Paper, seems to have little doubt on the subject, and said in a special report: "The possible scope of private general practice will be so restricted that it may not appear worth while to preserve it."

There are apparently a few extreme advocates of state medicine who think it advisable to make every physician a full-time servant of the State. Yet this attitude is far from general. In this, as in other aspects of the whole problem of socialized medicine, not only is opinion fluid, but no person now living can know with certainty what the ultimate framework of medical practice will be.

Horder, like many other physicians, fears that if medicine were nationalized "the spirit of individual initiative and adventure which has always characterized British medicine would be seriously damped, and men and women with good brains and healthy ambition would no longer be attracted to the profession." It is worthy of note, however, that, in spite of Horder's apparent acceptance of the belief that full nationalization is the ideal of the sponsors of socialization in Great Britain, he suggests that if medicine were nationalized the "black market" in doctoring would be terrific.

An interesting feature of Horder's address is the extent to which, while condemning "nationalization," he approves of medical services which only through socialization can become generally available to persons of moderate means. In

other words he shares the general trend toward socialization of medicine which has been manifested for many years, and which is likely to show a steady further advance regardless of the fate of legislative measures now under consideration in Great Britain and the United States.

Horder is probably correct in his impression that a proposal to make full-time civil servants out of doctors would in itself be capable of producing a widespread reaction against a scheme for national medicine. "I believe," he says, "that the public, when it is really stirred to consider the matter, when it really thinks, . . . will decide against making all doctors Civil Servants." For this, he intimates, would in considerable degree destroy the doctor-patient relation.

In the general proposals thus far advanced in the two great English-speaking countries, it is rather difficult to find definite suggestions that all doctors should be made civil servants, in other words, full-time employees of the state; and according to these proposals it seems rather probable that very many general physicians, even many consultants, might still retain the doctor-patient relation. It should be realized, moreover, that at the present time the doctor-patient relation is hardly possible or essential in the Public Health Service, where excellent work is done by doctors who are civil servants. Nor, at the present time, is the doctor-patient relation very much to the fore in some specialties, such as pathology and bacteriology, or radiology. Obstetric work as carried on in a great municipal hospital is also less conspicuous for this relationship than some other medical activities.

Perhaps Horder's title ought to have been modified to read "To what extent shall we nationalize medicine?" although this might have been less rhetorically attractive as the title of an address or of a leading article. The establishment of



the National Health Administration of Great Britain was a long step in the direction of nationalization. Each World War, particularly as regards the United States, has moved in the direction of nationalization, by bringing greater numbers of veterans and their families under the medical control of Federal agencies. If for simplicity we loosely include the activities of local governments under the meaning of nationalization, very much in the practice of medicine among the poorer social groups has been nationalized for a long time.

But it is a far call from any of these activities to the bogie which Horder erects and then demolishes, of a state system of medicine in which every physician would be a civil servant and no citizen could obtain private medical care. Professor John A. Ryle, of Oxford, criticising Horder's address in a subsequent issue of the *British Medical Journal* (1945, March 31, page 456), stigmatizes as an "assumption" Horder's argument that "State medicine must necessarily impose control on the professional thought and actions of the doctor and spoil his age-long human relationships with his patients." Ryle suggests that there is no reason why free speech on medical matters, free criticism of medical affairs, and free publication of scientific work should not be preserved under a national system.

Horder's address gives to some extent the impression of an attempt to please his medical audience without too vigorously committing himself to either extreme of the argument. Perhaps this attitude was necessary in a district where the Socialist viewpoint is particularly strong among the general population, and where it may be supposed that this political coloring has affected a rather greater proportion of physicians than in other parts of Great Britain.

We can, however, all sympathize with Horder's admiration of the ideal doctor-patient relation as described in Nathaniel Hawthorne's "Scarlet Letter," and with Horder's answer to the self-imposed question "Do you see hope in the future of medicine?": "Yes," he says, "I see more hope, both for ourselves as doctors and for the people who will come under our care, in the future of medicine than perhaps in any other single thing in the new world towards which we are hacking our way. . . . We stand for sane knowledge, selflessness, and mercy in a world gone mad. We cannot let down these people who trust our profession, and it is in this firm resolve that we shall face the future of medicine."

W. H. Crisp.

#### PREPAYMENT OF MEDICAL CARE

Occasionally in previous editorials and elsewhere the writer has introduced the subject of prepayment of medical care in connection with other items of economic importance to the doctor, but has had in mind to discuss this more fully when opportunity arose. The introduction into Congress of a revived Wagner-Murray-Dingell Bill, 1945 model, provides this excuse.

Prepayment of medical care is no new idea. In June, 1944, a second edition of its publication "Prepayment medical care organizations" was distributed by the Social Security Board. It lists 219 such associations. Even a casual glance through this 130-page booklet suggests that many of these have been in existence for a long time, some of the private groups having been formed more than 25 years ago, and state organizations earlier. In the plans listed, and a fair number have been omitted, over three million persons are eligible for care.

In the writer's file on this subject is an editorial from the St. Louis Post-Dispatch of October 29, 1944, on "City sponsored health insurance plan with full medical coverage about to be launched in New York."

The plan was backed by Mayor La Guardia and a group of "outstanding" citizens and was to be available to families with annual incomes of \$5,000 or less. The first participants in the plan were to be city employees, but opportunities for enrollment were to be offered to groups of 50 or more in private industry. This plan met the opposition of local, state, and national medical societies, which offered a counterplan for broadening the highly effective Associated Hospital Service. The outcome of these proposals is not known to the writer and their details need not be considered here, since probably no action has been taken on most of the larger proposed plans because the legislation pending in Congress would place the whole matter on a nation-wide and Federal basis. It is cited merely as evincing a straw in the wind.

Some state medical organizations, as in Missouri, have approved and are beginning to carry into effect plans that must be regarded as an attempt at placating the people who want prepaid care. In that State organized medicine has presented a scheme for voluntary enrollment of members and doctors to care for patients while in hospital for certain conditions at specified rates which, however, can be raised by agreement between patient and doctor. Enrollment costs for the patient are very reasonable but the proposition seems scarcely attractive enough to be very far-reaching.

The revised version of the Wagner-Murray-Dingell Bill is discussed editorially in the June 2d issue of the Journal of the American Medical Association, in which issue there is also the first part of

a discussion of the Bill in detail. As the editor points out, the compulsory feature is everywhere pushed into the background, and choice of participating physicians as to fee-for-service or salary payment is stressed, but nevertheless compulsion is there.

Pertinent to this discussion is a report of the Health Program Conference, a by-product of the Committee on Research in Medical Economics, entitled "Principles of a nation-wide health program." This group was composed of 26 well-known individuals, lay and medical. The second paragraph of the summarized report contains the gist of the matter:

"Medical services should be financially accessible to all through a national system of contributory health insurance, combined with taxation in behalf of people without sufficient income, preventive services and needed extensions and improvements of facilities. In order that comprehensive service shall be available to all or most of the population and in order to minimize the administrative costs of acquiring members, it is essential that financial participation in the system be required by law. The contribution for medical care insurance will not mean an added burden on the earnings of workers. The American people are now spending for physicians' services and hospitalization enough to provide for all with only minor supplementation, if these payments are regularized, instead of falling with disastrous uncertainty. Place should be maintained for voluntary action by many agencies as well as for action by our national, state and local governments." The second sentence, insisting on the necessity of the service's being compulsory certainly dismisses a very dubious point in a summary manner. This involves the acceptance of a completely paternalistic attitude with regard to the medical care of the American people. We don't have compul-

sory Federal education, but we are to have compulsory medical care. These two things are different, to be sure, and medical care is distinctive from every other type of care, and perhaps being so closely bound to the welfare of the nation and being humanitarian as well it is wise to make it compulsory nationally, but at least let us recognize that this is the action that is being taken and not accept it unknowingly.

Three methods of payment of the physician are suggested and the last promptly discarded as having been tried and found wanting. This is the fee-for-service principle. The first method is the obvious one of annual salary, presumably somewhat on a time basis; the second, or capitation, method is that under which the physician is paid a fixed amount per annum for each person who selects him as his regular doctor. Obviously that might serve for that specimen now rarely found except in rural communities, the general practitioner, but would be impractical for specialists. Hence only the annual salary remains.

An interesting article along these lines appeared in the December, 1944, issue of *Fortune*, entitled "U.S. medicine in transition." The race between the doctor's efforts to formulate some acceptable voluntary plan and the public's demand for a Federal plan is discussed with the conclusion that the Federal plan will probably win.

This writer feels certain that some prepayment plan or plans will surely be worked out soon for almost everyone. The method is expedient and economically sound, but it is still questionable in his mind whether it should be compulsory; there might well be loopholes for doctors and patients who preferred some other method of handling medical care. Probably the salary plan for all physicians would lower the general character of medicine but perhaps broadening

the base of service would compensate somewhat for this.

Lawrence T. Post.

## OBITUARY

MARK J. SCHOENBERG\*  
(1874-1945)

Mark Joseph Schoenberg was born on December 23, 1874, in the little Rumanian town of Pitesti. Upon completing the course in the local school and "gymnasium," he was admitted to the University of Bucharest, where he was graduated M.D. in 1898. After two years of graduate work in Vienna and in Germany, he came to America in 1900, and began the practice of medicine on the lower East Side of New York. While at first the necessity of earning a livelihood compelled him to practice general medicine, his interests and his graduate training naturally guided him into the specialty of ophthalmology.

After working in the Eye Clinic of the Mount Sinai Hospital and for a few years maintaining his own clinic and hospital in lower Manhattan, he became associated with the New York Ophthalmic and Aural Institute under Hermann Knapp, in 1908. After the death of its founder, this institution became known as the Hermann Knapp Memorial Eye Hospital, and in 1918 Dr. Schoenberg was made attending surgeon. While there, he taught in the Graduate School maintained by the Hospital, as well as at the College of Physicians and Surgeons of Columbia University. Somewhat later, he became Consultant in Ophthalmology to the Presbyterian Hospital and to the Bronx Hospital.

For some years he had been intrigued by the problem of glaucoma and had ad-

\* Read at the New York Society for Clinical Ophthalmology, March 5, 1945.

vocated, among other things, the creation of clinics devoted especially to the study of that disease. The first Glaucoma Clinic was established at the Knapp Memorial Eye Hospital in 1935, and Dr. Schoenberg was made its director.

The pursuit of the problem of glaucoma became a passion with him, and he was instrumental, with the coöperation of the National Society for the Prevention of Blindness, in the establishment of glaucoma clinics in other hospitals. Up to the time of his death he was director of the Glaucoma Clinic of the Manhattan Eye, Ear, and Throat Hospital as well as consulting ophthalmologist to that institution. He was also chairman of the Committee on Glaucoma of the National Society for the Prevention of Blindness, as well as a member of the Board of Editors of its publication, the *Sight-Saving Review*. To him is due much of the credit for focusing upon glaucoma the attention of medical practitioners and the lay public. A considerable portion of his recent research has been on the early detection of glaucoma and even of the preglaucomatous state by means of studies of ocular drainage and pupillography. His elucidation of the psychosomatic factor in glaucoma is an example of the breadth with which he viewed the problem, and may yet prove to be of fundamental importance.

Dr. Schoenberg contributed much to ophthalmologic literature as well as to open discussions at scientific meetings which he attended faithfully and with enthusiasm. He was a Fellow of the American Academy of Ophthalmology and Otolaryngology, the American College of Surgeons, and the New York Academy of Medicine, of whose eye section he served as chairman in 1932. He was a member of the American Ophthalmological Society, the New York County and State Medical Societies, and the American Medical Association. He was one of the founders of the New York Society for

Clinical Ophthalmology and served as the president of that organization in 1935.

In 1940, on the occasion of his sixty-fifth birthday, a number of his colleagues gave him a testimonial dinner at which he was presented with a large bound volume containing all his scientific articles, 46 in number. For his work on the experimental study of anaphylaxis the New York State Medical Society awarded him the Lucien Howe Medal.

These were his material achievements, such as one might expect of any outstanding physician and scientist of Dr. Schoenberg's stature. What endeared him to those about him, whether family, colleagues, pupils, or patients, was the warmth and charm of a nature which made only friends. Those of us who had the good fortune to be closest to him were familiar with the special kind of radiance that would come into his face and voice when speaking of his family.

To us, his colleagues, his assistants, and his pupils he was known as the one with the youngest mind, a mind which never grew tired of seeking and probing, an intellect which glistened from the numerous facets of his varied interests. The enthusiasm with which he pursued an intellectual problem was contagious to those about him; his cheerfulness and sharp wit and good-natured humor made working with him a pleasure. At least one of his pupils has named a first-born son after him.

To his patients, whether those in high places or the poorest or most ignorant, he gave not only of his skill, but of his heart. While he might occasionally lose patience with a patient in the office, he has never been known to be anything but gentle in the clinic, where he exhibited his great talent for putting people at ease without being patronizing. Best of all evidence of his nature was the spontaneity with which young children trusted him.

While not a religious man in the con-

ventional sense and scarcely ever attending formal services at synagogue, his life was a fine example of the ethics, morality, and culture of his race at their best. He lived for his fellow man and for his chosen work, and he gave freely of his time and earnings to those less fortunate than himself. The high station which he had attained in his community did not prevent him from remaining decidedly liberal in his political thinking and his philosophy. He left behind him no great fortune, but rather innumerable lives made better by the gift of sight at his hands, very many others enriched by the privilege of his friendship.

His only fault was his inability to conserve his energy, and this, at least in part, was his undoing. Although many times warned that he must reduce the burden of his work, it was not in his nature to do less than the maximum. He continued, not only in the office but in the clinic until only a few months before his death.

It is with heavy heart that we realize that Dr. Schoenberg will no longer be among us. Admittedly there are many ophthalmologists who are skillful of finger and brilliant of mind, many who are upright, and generous and good, some with presence and culture and taste, a few with a delightful sense of humor. Rare to find are those who combine these qualities as did Mark Schoenberg.

Benjamin Esterman.

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## CORRESPONDENCE

### THE CASE AGAINST THE BLANK OCCLUDER

Editor,

American Journal of Ophthalmology:

It is as natural to shorten focus (ac-

commodate) when a large opaque object is brought close to the eye as it is to close the lids under the same circumstances. Therefore, if a strong plus sphere be substituted for the blank occluder in all tests of refraction, except in patients having marked amblyopia, it will be found that a much greater amount of latent hyperopia will be uncovered in a high percentage of cases. The eye will look *through* the plus lens. It will look *at* the blank occluder and a variable amount of accommodation will be the inevitable result.

After the manifest refraction is tested in each eye separately it is desirable to fog both eyes slightly and equally by the addition of plus spheres; then by exposing them alternately and adding more plus sphere to the eye having the better vision at distance, they are brought to a state where they see equally badly. This balances the spherical equivalents of the two eyes and when it is followed by a gradual, equal, and simultaneous reduction of plus spheres before them the point of the greatest vision with the greatest plus is most easily ascertained.

However, if in this balancing procedure a blank occluder has been used, the eye most recently behind it will be partially dark adapted, and the patient is apt to pick the brighter image rather than the one exhibiting the better definition.

It is my conclusion that the blank occluder is a pernicious adjuvant to the refraction of nonamblyopic eyes, and that its further results in many patients' being classed as myopic when their true uncorrected vision may be far in excess of the 20/20, at distance, customarily required in certain occupations.

(Signed) H. E. ALLEN  
Metropolitan Building,  
Columbia, Missouri

# ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

## CLASSIFICATION

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|--|--|
| 1. General methods of diagnosis                        | 10. Retina and vitreous                                |
| 2. Therapeutics and operations                         | 11. Optic nerve and toxic amblyopias                   |
| 3. Physiologic optics, refraction, and color vision    | 12. Visual tracts and centers                          |
| 4. Ocular movements                                    | 13. Eyeball and orbit                                  |
| 5. Conjunctiva   | 14. Eyelids and lacrimal apparatus                     |
| 6. Cornea and sclera                                   | 15. Tumors   |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries   |
| 8. Glaucoma and ocular tension                         | 17. Systemic diseases and parasites                    |
| 9. Crystalline lens                                    | 18. Hygiene, sociology, education, and history         |
|  | 19. Anatomy, embryology, and comparative ophthalmology |

### 8

#### GLAUCOMA AND OCULAR TENSION

Kronfeld, P. C., and Haas, J. S. Glaucoma due to peripheral anterior synechias after operation for cataract. *Arch. of Ophth.*, 1945, v. 33, March, pp. 199-202; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42.

The multiple factors which influence intraocular pressure are so closely interrelated and regulated in the normal human being that it is almost impossible to attribute a given rise in intraocular pressure to the action of any single factor. Even in the case of the best known rise occurring in the normal human eye, that during Valsalva's experiment, one is unable to decide whether the cause is increased volume of blood in the uvea or interference with the function of Schlemm's canal. Ocular disease occasionally singles out one of the main factors concerned with the regulation of intraocular pressure and thus creates a glaucomatous state with a much simpler mechanism than that underlying normal intraocular

pressure. A classic example of such a glaucomatous state is that caused by peripheral anterior synechias following prolonged absence of the anterior chamber after operation for cataract. The detailed study of such eyes promised to yield information of value for the understanding not only of this type of glaucoma but also of problems of regulation of intraocular pressure in general. It was for these two reasons that the present study was undertaken.

The study concerns itself with states of persistently elevated intraocular pressure of aphakic eyes in which (1) careful examination before extraction of the cataract, including at least one tonometric reading, had revealed no sign of glaucoma; (2) the inflammatory postoperative reaction was slight and either had completely subsided or was definitely diminishing in intensity 14 days after operation; (3) the anterior chamber had been absent for at least six days after operation; (4) extensive peripheral synechias were found on gonioscopic examination; (5)

the severity of the glaucoma closely paralleled the extent of the peripheral anterior synechias; and (6) observation of the normal second eye after the surgical procedure revealed no sign of glaucoma.

Invariably in the cases thus complicated no sutures or only conjunctival sutures had been used during the operation for cataract. Thus it appears highly probable that absence of the chamber was caused by external fistulation.

The following phenomena were studied: (1) the diurnal variations of intraocular pressure; (2) the response to parasympatholytic mydriatics; (3) the response to the drinking test; (4) the response to puncture of the anterior chamber; (5) the response to corneal massage for two minutes with the tonometer of Schiötz, using the 15 gm. weight; (6) the response to pilocarpine.

After admission and acclimation to the hospital most patients showed diurnal variations of a regular pattern. The taking of measurements was restricted to intervals of four hours to reduce the possibility of thereby altering the intraocular pressure. The curve was invariably of the inverted type, with the low value at 2 a.m. and the high point between 10 a.m. and 2 p.m. In corroboration of previous findings of Raeder and Kronfeld, the morning rise could be prevented by keeping the patient asleep or could be precipitated earlier by mild exercise at 2 a.m.

Tonometric measurements made at or around noon are most likely to reveal the highest pressure reached by the individual patient. Of the provocative tests, introduction of a mydriatic and puncture of the anterior chamber are not likely to give definitely abnormal results. The massage test and especially the drinking test are more likely

to reveal insufficiency of the apparatus regulating intraocular pressure.

With regard to conservative therapy, it would seem reasonable to use miotics during the early morning to prevent the usual morning ascent of intraocular pressure. The first application should be made "the very first thing in the morning," and this should be followed by one to three additional applications during the morning if necessary. During the afternoon and during the night these eyes more or less take care of themselves. An application before the patient retired would be wasted, since its effect would not last until the next morning. (3 charts, 3 tables, references.)

R. W. Danielson.

Meyer, S. J., and Sternberg, P. Surgical management of glaucoma in correlation with gonioscopy and biomicroscopy. *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1945, 49th. mtg., Jan.-Feb., pp. 147-154.

Ordinarily the acuity of the angle may be obtained with the biomicroscope by placing the slitlamp beam perpendicular to the cornea at the site of the angle of the anterior chamber, the corneal microscope being angled for specular reflection and focused first on the posterior surface of the cornea and then on the anterior surface of the iris. Gonioscopically, narrow-angle glaucoma is usually acute primary congestive glaucoma. Although narrow, the angle is usually open when the first attack begins but closes more or less completely during the attack. Iridencleisis is preferred to basal iridectomy, which should be done during the first 24 hours of the acute glaucomatous attack. The trephine operation is here considered technically difficult and the risks are usually too great to justify its

performance. In simple or wide-angle glaucomas, the narrow-angle mechanism is excluded. Varying amounts of pigment deposit within the corneoscleral trabeculae, trabecular sclerosis, and peripheral synechias are present in the later stages. Here iridencleisis is also preferred unless marked iris atrophy exists. Then trephining is the operation of choice.

In secondary glaucomas following cataract extraction, the anterior chamber is gonioscopically closed and peripheral anterior synechias of varying extent are present. Cyclodialysis is usually not advised in narrow-angle glaucomas and only occasionally in wide-angle glaucomas with slightly elevated tension or as a secondary operation following a partially successful filtering operation. In glaucoma associated with capsular exfoliation the gonioscope shows deposition of fine flakes throughout the angle structure usually accompanied with heavy pigmentation of the trabeculum. The angle is of the wide-angle type with relative absence of peripheral anterior synechias. Iridencleisis or trephining may be performed, because of width of the angle. The former is preferred. Glaucoma surgery is advised first and cataract surgery later, if necessary. In hemorrhagic glaucoma following occlusion of the central retinal vein the angle is open gonioscopically during the earlier stages, but later is completely closed. In diabetic rubeosis iridis, the biomicroscopic and gonioscopic findings are similar. In both, the inferior half of the pars plicata of the ciliary body is diathermized. Enucleation is the alternative surgical procedure. In glaucoma associated with lenticular intumescence, the gonioscopic picture is much the same as in acute

glaucoma. Removal of the lens by combined extraction is advised, avoiding sudden decompression and trauma to the iris or lens. Charles A. Baln.

Rocha, H., and Bonfioli, A. Gonioscopy and hydrophthalmos. *Ophthalmos*, 1944, v. 3, no. 3, pp. 243-249.

After brief discussion, the author expresses the following opinions: In the majority of the cases, congenital glaucoma arises in obstruction of the chamber angle by persistent mesodermic tissue. Absence of the canal of Schlemm, and peripheral synechias, are effect and not cause. Gonioscopy ought to be a routine practice in these cases. Operation (goniotomy) before the age of one year is desirable. (One color plate with diagram.) W. H. Crisp.

Williamson-Noble, F. A. Remarks on iridencleisis. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 324-331.

The author advises that a miotic be not used for at least 12 hours before the operation; that retrobulbar injection of 2 c.c. of 4-percent novocaine with the addition of 4 drops of adrenalin be used except in older patients with high blood pressure; that the conjunctival flap include the episcleral tissue; and that a keratome incision be so made in the limbal area that on withdrawal of the keratome the section be 5 to 6 mm. long. Massage of the eyeball is begun after the first dressing, having the patient look up and massage the ball lightly through the lower lid for half a minute and repeating twice daily, unless the eyeball is soft. The patient is advised to perform the massage two minutes twice daily for six months after leaving the hospital. (References.)

Beulah Cushman.



## 9

## CRYSTALLINE LENS

Bannon, S. L., Higginbottom, R. M., McConnell, J. M., and Kaan, H. W. Development of galactose cataract in the albino rat embryo. *Arch. of Ophth.*, 1945, v. 33, March, pp. 224-228.

In 1935 Mitchell first reported the type of cataract in rats which results from a diet containing a high level of galactose. A series of investigations, begun in 1937, have definitely established the fact that when pregnant female rats are fed a diet containing 25 percent of galactose, cataractous changes appear in the lenses of the embryos. The authors outline the results obtained in three strains of rats, making a study of more than 300 lenses from a normal series and an approximately equal number from the experimental series. Detailed technical description of the lens changes is given.

The location of the primary area of degeneration within the lens nucleus is a characteristic of cataract in the young. If cataract is the result of a metabolic disturbance, presumably those areas of the lens which have a higher metabolic rate should be the most susceptible. The sequence of cataractous changes in the embryo is clearly related to developmental changes within the lens. Onset of the cataract affects the central fibers, which are undergoing modifications preparatory to the formation of the lens nucleus. As development progresses, closure of the posterior suture marks another region of cellular activity, and cataractous changes shift from the central to the more posterior region of the lens. Sections of normal lenses show that vacuoles arise apparently as the accompaniment of normal activity. Extreme vacuolation seems to be due to

continuation and exaggeration of a condition already existing within the lens. Comparison of the photomicrographs, all taken at the same magnification, makes it apparent that presence of the cataract does not interfere with normal increase in size of the lens. Thus, it is not the growing regions which are affected but those portions of the lens which are undergoing differentiation. (2 figures, references.)

R. W. Danielson.

Bellows, John. Frequency and location of punctate opacities in three hundred young crystalline lenses. *Arch. of Ophth.*, 1945, v. 33, March, pp. 229-236.

The frequency of opacities in the young crystalline lens is so great that it has been considered physiologic by some ophthalmologists. The purpose of this investigation was to determine the incidence of opacities in Americans between 18 and 40 years of age and to correlate changes and age in the hope that light might be thrown on the causation of senile cataract. In a United States Army general hospital, slitlamp examinations were made while the eyes were under homatropine cycloplegia. Altogether 150 subjects, or a total of 300 eyes, were examined, eyes showing signs of ocular disease or of trauma being excluded.

Only 8 of the 300 eyes examined were entirely free from lens opacities. All others showed punctate opacities in one or more regions of the lens. Because of the difficulty of differentiating between congenital and presenile forms of punctate opacity, the latter were considered to be physiologic and were included in this survey. In 4 percent of the eyes the opacities were associated with coronary cataract. Punctate opacities were found in all the layers of the lens, but were far more common between

the bands of disjunction and the region of the Y sutures, and were more numerous anteriorly than posteriorly. Not uncommonly the opacities arranged themselves in concentric layers surrounding the nucleus. These opacities are regarded as precursors of peripheral concentric lamellar opacities in the senile lens, a true form of senile cataract. At times punctate opacities of unusually small size are present in the anterior cortical suture-system.

The author concludes that punctate opacities, which are found in nearly all adult lenses, increase in number with the age of the subject. As a sign of aging of the lens, they precede nuclear relief, increase in the elementary stripes composing the adult nuclear band, and yellowing of the nucleus. (3 figures, references, complete detailed table.)

R. W. Danielson.

Kronfeld, P. C., and Haas, J. S. Glaucoma due to peripheral anterior synechias after operation for cataract. *Arch. of Ophth.*, 1945, v. 33, March, pp. 199-202; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42. (See Section 8, Glaucoma and ocular tension.)

Neff, E. E. Factors affecting hemorrhage following extractions of cataracts. *Arch. of Ophth.*, 1945, v. 33, March, pp. 192-198; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42.

Ninety-eight patients upon whom a total of 205 operations were performed are considered in detail. The papers of Knapp, Wheeler, Vail, Gradle and Sugar, DeVoe, and others are discussed. The author's work seems to confirm the conclusions of others that age, systolic and diastolic blood pressure, anemia, platelet level, bleeding time, coagulation time, results of tourniquet tests, and the existence of diabetes or

nephritis are not significant factors for anticipating the occurrence of postoperative hemorrhage.

The greatest frequency of hemorrhage was with combined intracapsular extraction, the incidence of bleeding being 20.6 percent, in contrast with 7.8 per cent for intracapsular extraction after preliminary iridectomy. There were hemorrhages only in 3.2 percent following preliminary iridectomy. The total incidence of hyphemia for the whole series was 11.2 percent. Trauma was known to be instrumental in 48 percent of the cases of hemorrhage. These results substantiate the theories of Wheeler and Vail that trauma and type of operation are two important factors influencing postoperative bleeding. (3 tables, references.)

R. W. Danielson.

Páez Allende, Francisco. Concerning a case of spontaneous and complete dislocation of a clear lens into the vitreous. *Arch. de Oft. de Buenos Aires*, 1943, v. 18, March, p. 171.

A case of spontaneous dislocation of a clear lens into the vitreous. The patient was a woman aged 82 years. The author discusses briefly the prognosis, frequency, and etiology of the condition. (Bibliography.)

Plinio Montalván.

Pimentel, P. C. New procedure for intracapsular extraction of cataract. *Rev. Brasileira de Oft.*, 1945, v. 3, March, pp. 137-142.

The author has designed, and has used in a few cases, a wire loop curved into a hook at the extremity. The corneal flap is lifted with one of the angles of the loop, which is then passed between the cornea and the lens to the lower border of the latter, sliding the iris downward, and being insinuated

between the equator of the lens and the ciliary processes so as to break the lower fibers of the zonula. If the zonula is too resistant, a slight lateral movement is sufficient to break it. As the lens rises on the arms of the loop, the handle of the instrument is brought forward so as to depress its extremity, the slight pressure thus made on the vitreous bringing the upper border of the lens forward. Various possible complications of the technique are discussed. In the limited number of cases in which this technique was employed, extraction was complete and without loss of vitreous. (8 illustrations.)

W. H. Crisp.

## 10

### RETINA AND VITREOUS

Amenábar Prieto, Mario. **Clinical and technical considerations on retinal detachment.** Arch. de Oft. de Buenos Aires, 1943, v. 18, March, p. 135.

The author makes an exhaustive study of 22 cases of retinal detachment, the histories of which are given in detail. Both direct and indirect ophthalmoscopy were used in the preoperative examination. The greater number of tears were found in the outer half of the retina, the frequency being higher in the supero-external quadrant. Tears were multiple in 40 percent of the cases. The author considers as important elements of prognosis and cure the trial binocular bandage, rest in bed, intraocular tension, the response to atropine, and the condition of the vitreous. He also uses a modified transillumination method for localizing the tear. After the tear is visualized with an ophthalmoscope by ordinary light, a transilluminator is introduced through the conjunctival incision and passed over

the zone of the sclera corresponding to the location of the tear. At this moment the illumination of the ophthalmoscope is changed to red-free light and the tear appears as a dark-red spot in a blue background. With good localization a minimum number of diathermy punctures are required.

The lowest intensity of current possible is used, giving preference to surface coagulation, and only using penetrating diathermy when strictly necessary. If a detachment recurs because of weak diathermic coagulation, it may be cured by a second intervention. On the other hand, if the recurrence is due to excessive coagulation, a second operation will make the condition worse. Since retinal detachment is not often corrected with one operation, the need for further surgery must not be interpreted as a sign of failure. The author considers the following as criteria for cure: complete sealing of the tear, improvement in the fundus picture, and marked improvement of both visual acuity and fields, maintained during an observation period of three months.

Plinio Montalván.

Ballantyne, A. J. **Retinal changes associated with diabetes and with hypertension.** Arch. of Ophth., 1945, v. 33, Feb., pp. 97-105.

The retinal changes with diabetes and hypertensive diseases are separate entities, both clinically and histologically. The earliest demonstrable changes in both conditions occur in the vessels, venous changes in diabetes and arterial alterations in hypertension.

In diabetes these changes point to venous stasis. In addition to the hemorrhages and exudates, they consist of congestion of the veins, microaneurysms on the capillaries, and gross

changes in the principal veins. The microaneurysms may occur alone and seem to be the earliest abnormal change in the diabetic fundus. They may be mistaken for minute round hemorrhages. The earliest histologic change takes the form of minute fatty granules in the vascular endothelium, together with swelling of the endothelial cells. In hypertension fatty granules are observed more frequently in the media and adventitia. The retinal veins of the diabetic patient show expansions, beading, and the formation of loops, coils, and networks, and the predominant histologic changes are phlebosclerosis and intraretinal and preretinal networks of large, thin-walled vessels. Hemorrhages in diabetic retinal disease are usually rounded and occur primarily in the central area of the fundus, chiefly in the internuclear layer.

In hypertensive disease, arterial changes predominate. The hemorrhages are primarily circumpapillary and striate, owing to their superficial situation in the nerve-fiber layer. Exudates may occur in the deep layers but also include patches of ganglioniform degeneration in the nerve-fiber layer.

Possibly both forms of retinopathy result from toxic factors acting on the blood vessels. These factors may be specific to hypertension or to diabetes and the differentiation of the two forms of retinal changes may be due to selective action on the walls of the capillaries and larger vessels. (8 figures, references.)

John C. Long.

Barraquer Moner, J. I. Instruments and technique for operation on detachment of the retina. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, March-April, pp. 211-218.

A detailed description of the operation for retinal detachment, using surface diathermy and punctures by catholysis. (10 illustrations.)

J. Wesley McKinney.

Busacca, Archimede. A view of the normal fovea and macular region through the stereoscopic ophthalmoscope. *Anales Argentinos de Oft.*, 1944, v. 5, Jan.-Feb.-March, pp. 8-12.

This follows a report presented about one year ago. The fovea is visualized as a distinct dark-red central disc, 3 to 5 mm. in diameter, with linear light reflexes passing over to the grayish-red of the macula. At times this area of the fovea seems to contain rose or yellow granules which may be attributed to the underlying choriocapillaris. If the granular appearance becomes very marked it may be considered pathologic. Occasionally a gauzy transparent tissue over the central fovea aids us in appreciating the cup shape of the fovea—a definite difference in level between the anterior and posterior parts being visualized. The author feels there is no true foveola. Foveal variations noted are changes in depth of color, pigment, and light reflex. The perifoveal region extends for 1 to 1.5 mm. around the central foveal disc, is grayish-red in color, and has a metallic reflex. This area, too, has a yellowish granular appearance. No conclusive statement can be made concerning the reason for the yellow color of the macula.

Edward Saskin.

Leopold, I. H. Intravitreal penetration of penicillin and penicillin therapy of infections of the vitreous. *Archives of Ophth.*, 1945, v. 33, March, pp. 211-216. (See Section 2, Therapeutics and operations.)

O'Malley, C. L. C. **Spontaneous retinal and vitreous hemorrhages in young adults (Eales's disease).** Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 395-402.

The author reviews the history of this subject, and reports five cases.

Many causes have been cited, but in later years tuberculosis has often been observed in eyes removed later for secondary glaucoma. The author presents a review of some of these cases and of the experimental work done. He reports eight such cases, with the ocular and general physical findings. (2 tables, references.)

Beulah Cushman.

Pischel, D. K. **The basic principles of retinal detachment operations, with special reference to the eyeball shortening operation.** Trans. Amer. Acad. Ophth. and Otolaryng., 1945, 49th mtg., Jan.-Feb., pp. 155-171.

Retinal detachments are classified thus: (1) so-called idiopathic or simple detachments and those caused by direct trauma to the eye, which are all considered operable; (2) those due to more or less dense strands in the vitreous, pulling the normal retina from its base; of which a few are operable by special procedures; (3) those caused by intraretinal hemorrhages, which are rare and heal spontaneously; (4) those due to formation of so-called pathologic subretinal fluid, in which healing depends on removal of the underlying cause; (5) those caused by neoplasms, to be cured by enucleation. Fundamental in the operative treatment of all detachments are the following considerations: Detachments are caused by one or more holes or tears in the retina. They tend to be spread by the normal

rotations of the eyes. To cure a detachment, the hole or tear must be closed or walled off from the rest of the fundus by a solid line of water-tight chorioretinal adhesions.

Any operative cure of retinal detachment must produce an exudative choroiditis, at that point to which the tear in the retina will be brought as the retina settles down. The retina must be allowed to settle back to its normal position and remain there long enough for the tear to touch this exudate and be sealed by it. The subretinal fluid must be drained away, allowed to absorb, or both. The operative technique which best accomplishes these purposes will result in the highest percentage of cures. Diathermy is easy to use, its amount can be varied simply, and the apparatus required is not complicated. Direct visual control during the operation is emphasized.

In difficult and unusual cases special procedures are often required. In aphakic eyes, diathermy seems to have a tendency to make the vitreous shrink. Here, Lindner's undermining operation may be the operation of choice. In eyes in which the detached retina has become too small to fit the interior of the eye, the operation of scleral resection is advised. Its technique is described in detail. The operation should be reserved for desperate cases and performed before degenerative changes are advanced. The percentage of cures obviously will be small.

Charles A. Bahn.

Terry, T. L. **Retrolental fibroplasia in premature infants.** Arch. of Ophth., 1945, v. 33, March, pp. 203-208; also Trans. Amer. Ophth. Soc., 1944, v. 42. (See Section 13, Eyeball and orbit.)

## 11

OPTIC NERVE AND TOXIC  
AMBLYOPIAS

Alcaino, Alfredo. Surgery of the optic canal. *Rev. de Otorrinolaringologia* (Chili), 1942, v. 2, Sept., pp. 39-51.

The author first describes the anatomy of the optic canal, with special attention to the anatomic characteristics of the orbital circulation. Reference is made to the frequency and mechanism of involvement of the optic nerve in the traumatism of the cranium; to orbito-ocular symptoms of orbital fractures; to the pathogenesis of intracanalicular lesions of the optic nerve; and to radiography of the optic canal. Worms's surgical method of approach to the optic canal is described, as originally published in *Archives d'Ophthalmologie*, 1932, April. The author further describes briefly seven cases in which the optic canal was approached by this technique.

W. H. Crisp.

Livramento Prado, Durval. Syphilis and the optic nerve. *Arquivos Brasileiros de Oft.*, 1944, v. 7, nos. 4 and 5, pp. 164-177.

With the aid of ten fundus photographs in black and white, the author reviews the following manifestations of syphilis in the optic nerve: optic neuritis, retrobulbar neuritis, disturbances of papillary vessels, gumma, papillary ectasia, and atrophy of the nerve. Two illustrative clinical cases are reported under disturbance of the papillary vessels, two under gumma, and one under papillary ectasia. The subject of systemic treatment is discussed.

W. H. Crisp.

Weskamp, Carlos. Optic atrophy from chiasmal arachnoiditis. *Anales*

*Argentinos de Oft.*, 1944, v. 5, Jan.-Feb.-March, pp. 1-7.

Weskamp states that the usual causes of optic atrophy, such as toxic and medicinal factors, hypophyseal tumors, new growths of the sella turcica and vicinity, gliomas or craniopharyngiomas, and syphilis, can be determined readily. In certain cases of progressive optic atrophy leading to blindness, with no demonstrable etiologic factor, chiasmal arachnoiditis, frequently luetic, must be considered strongly, especially since this condition can be relieved by operation. Three cases are reported, only the first being presented completely to the reader. All cases were of simple atrophy of the papilla with no causative factor in evidence. A diagnosis of chiasmal arachnoiditis was corroborated by operation in one instance, but no follow-up is given. Edward Saskin.

## 12

## VISUAL TRACTS AND CENTERS

Ecker, A. D., and Anthony, E. W. Head injuries from the ophthalmologist's viewpoint. *Brit. Jour. Ophth.*, 1945, v. 29, Jan., pp. 43-48.

The neurologic basis for several ophthalmic syndromes with closed head-injuries is presented. The fixed, dilated pupil of Hutchinson is an infallible sign of raised intracranial pressure, usually due to a laterally placed intracranial lesion of the same side, which is most often in the temporal but may be in the frontal or parietal lobe. The pupillary change is caused by herniation of the medial part of the temporal lobe into the tentorial notch. The underlying lesion may be a hematoma of any type or even contusion and swelling of the brain.

Bilaterally dilated fixed pupils soon after head injury, with neurogenic hyperthermia, rapid pulse, quickly rising rectal temperature, cold skin, and decerebrate rigidity, indicate damage to the mid-brain and a bad but not hopeless prognosis. Argyll-Robertson pupils of traumatic origin may result from lesions either in the central nervous system itself or in the peripheral efferent pathway to the pupil.

In the study of lesions of the temporal lobe, ventriculograms and cerebral angiograms, as well as studies of the visual fields, speech, electroencephalograms, and caloric nystagmus, can be used. The amount of cerebral damage can be estimated by means of the electro-encephalogram, which is also helpful in the diagnosis of hysteric amblyopia. Directional preponderance of caloric nystagmus to the side of the lesion is present when the temporal lobe alone is involved.

The location and nature of the neural lesion in any muscular palsy can roughly be determined by the length of time required for recovery. In cases of paralysis of one or more ocular muscles, orthoptic exercises should be encouraged, even in a completely paralyzed muscle, because these procedures, acting on the other extraocular muscles, will result in passive movement of the affected muscle with improvement in its blood supply. Such activities help prevent atrophy of the affected muscle and contracture of the antagonist while the nerve is regenerating.

Visual-field studies serve to show progressive changes. The presence of normal visual fields does not exclude the possibility of a slowly growing subdural hematoma overlying the optic radiation, since it is actually outside

of the brain substance. Thus there is significance in the presence of normal visual fields in a case of suspected subdural hematoma with significant lateral shift of the pineal body or appropriate spinal-fluid changes. (References.)  
Edna M. Reynolds.

Ironside, R., and Batchelor, I. R. C. The ocular manifestations of hysteria in relation to flying. *Brit. Jour. Ophth.*, 1945, v. 29, Feb., pp. 88-98.

The visual aberrations experienced by a normal aircrew under conditions of fatigue, anoxia, and anxious preoccupation are discussed for the purpose of distinguishing them from the grosser, more persistent and more disabling phenomena due to neurosis. Forty cases of hysteria are summarized. Blurred vision, photophobia, diplopia, and defective night vision are the four complaints most common in the series under consideration. The symptoms were out of proportion to any ocular disability found to be present. More than one fourth of the patients showed convergence weakness. From a physical standpoint all the men were fit for the exacting requirements of aircrew duty.

The fact that there is a correlation between the phorias and convergence defects on the one hand and neurotic constitution on the other hand is brought out, although it is made plain that not all heterophorias and defects of ocular convergence are of psychologic origin. Any inherent ocular defect may form the nucleus for any aggregation of hysteric symptoms. From those who develop a hysterical reaction, it is almost always possible to derive a history of personal neurotic traits or a family history of psychopathy, or both. In war time, after a severe traumatic

experience, individuals of relatively sound personality may develop hysteria.

In examining candidates for aircrew duty, an attempt was made to establish a correlation between ocular-muscle imbalance and predisposition to psychoneurotic breakdown. Of ten patients with convergence weakness, four were found to be very considerably and one severely disposed to breakdown. The necessity for finding possible evidence of neurosis is emphasized.

Treatment is considered feasible in cases following a severe traumatic experience and in individuals who have a considerable number of flying hours to their credit. Orthoptic treatment of hysterics is unlikely to be permanently successful. (References.)

Edna M. Reynolds.

Kohut, H., and Richter, R. B. Neuro-optic myelitis: A clinico-pathological study of two related cases. *Jour. Nerv. and Ment. Dis.*, 1945, v. 101, Feb., p. 99.

The authors describe two cases of spinal-cord and optic-nerve disease which they consider essentially alike. The dominant features of each are: (1) acute diffuse ascending myelitis associated with optic neuritis and no evidence of destructive changes elsewhere in the nervous system, except for nystagmus in case 1; (2) rapid, straightforward course, fatal in one instance, and without remission or progression in the other; (3) a phase of acute, aseptic, purulent meningitis during the course of the disease. With the exception of a few cases in the literature resembling these and called neuromyelitis optica, other signs of either dissemination or prolonged

course with remissions and exacerbations are absent.

On the basis of this the authors feel that it is legitimate to establish these two as cases manifesting an independent entity, rather than to classify them as do Putnam and Foster, as subvarieties of multiple sclerosis. The similarity may be so great that a differential diagnosis is impossible, but, according to the present authors, inclusion of their two cases under the heading of multiple sclerosis would so broaden the term that it would become meaningless.

The pathologic picture obtained from one of their cases likewise differs so from that of either a multiple sclerosis or a disseminated encephalomyelitis as to be likewise an argument against inclusion of the case in these groups. Diffuse, massive necrosis of the spinal cord, coupled with acute degeneration of the optic nerves, in the complete absence of dissemination elsewhere in the central nervous system, constitutes the pathologic complex of this condition.

In the first case a hint of causation was afforded by a recurrent pharyngitis which came on prior to the onset of the disease. The first episode was associated with a "tingling numbness" in both thighs, which disappeared only to reappear with massive involvement of the spinal cord and optic nerves after a recurrence of the pharyngitis. (Microscopic pictures of cord and nerve are given.) Owen C. Dickson.

Pennybacker, Joe. Papilledema due to intracranial venous obstruction. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 333-338.

A boy nine years of age was admitted with a short history of headaches,



vomiting, amblyopic attacks, and a little unsteadiness in walking. He had a papilledema of 4 to 5 diopters, full fields, and normal acuity. There was no disorder of ocular movements, and no definite neurologic abnormality other than unsteadiness of gait. An exploration was made, with preliminary probable diagnosis of a midline tumor of the cerebellum. No evidence of a tumor was found and the boy died some days later. At autopsy it was found that a tumor of the thymus gland had compressed the innominate vein, causing retrograde thrombosis of the left internal jugular vein, the left transverse sinus, the torcula, and the sagittal sinus.

In another case, similar symptoms, with some weakness of the right external rectus muscle, developed after external trauma with perforation in the occipital area. Two weeks after the injury there was bilateral papilledema, with normal acuity and fields. The ventriculogram and spinal fluid were normal, as was the child's general condition. At the end of two months the papilledema had subsided and the vision was normal.

Thrombosis associated with some infective process such as mastoid disease in which there may be an associated thrombophlebitis of the lateral sinus is probably more common. Progressive thrombosis of cerebral veins may occur as an occasional complication of pregnancy or the puerperium, or of such mild infection as subacute maxillary or frontal sinusitis. (References.) Beulah Cushman.

Rebello Machado, Nicolino. *Visual apparatus in injuries to the head.* *Ophthalmos*, 1944, v. 3, no. 3, pp. 311-344.

After 13 pages of preliminary con-

siderations, including references to the literature, the author summarizes 11 cases recorded by his colleague, Emilio Navajas, Jr., and continues with rather ample clinical records of 12 personal cases. He concludes with the following comments. Even slight injuries may involve the visual apparatus, especially in children, in whom even severe injuries may present no immediate symptoms. The ophthalmologist should always be called into consultation in such cases. The eye examination should include special attention to alterations in the pupil, avoiding the use of mydriatics. When the fundus appears normal, perimetry and campimetry should be resorted to as soon as possible. In investigating the patient's history as to remote injuries those of obstetric origin should not be ignored. (23 illustrations, references.)

W. H. Crisp.

### 13

#### EYEBALL AND ORBIT

Campbell, D. A. *Hereditary microphthalmia in albino rats.* *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 153-162.

The author presents the histologic appearance of microphthalmos in the embryonic rat eye. The microphthalmos was almost entirely due to markedly subnormal size of the posterior chamber of the eye. The uveal tract, including the ciliary processes and the iris, was thicker than normal. In all cases the retina was thicker, with multiple folds or an overgrowth in the neighborhood of the optic disc. The pigment epithelium was normal. Retinal rosettes were formed by a circle of cells from the outer nuclear layer, lined by the external limiting membrane and by a ring of rods and cones.

In those eyes in which there was a large mass of tissue near the disc, the glial tissue was increased and in some cases continued forward through the vitreous to fibrous tissue on the posterior surface of the lens. In some places no internal limiting membrane was seen, and the inner surface of the retina presented a lacework of glial fibers. In some eyes there was persistence of fibers in the area of the primary vitreous. The lens showed extensive degeneration in every case. (7 illustrations, references.)

Beulah Cushman.

Giri, D. V. A rare combination of developmental ocular defects in a dwarf. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 148-152.

The single case presented macrocornea, microphthalmia, heterochromia iridis, typical bilateral coloboma of the iris and choroid, coloboma of the disc and macula, concomitant convergent strabismus, and dwarfism. (3 illustrations, references.) Beulah Cushman.

Grünwald S, Enrique. Ophthalmocavernous thrombophlebitis. *Rev. de Otorrinolaringologia (Chili)*, 1943, v. 2, March, pp. 161-182.

With report of a series of cases the author associates a discussion of the pathology and symptomatology of this usually fatal disorder. His cases originated in acute purulent infection of the skin of the nasal vestibule, in the cheek, in the iris, and in the forehead. (References.)

W. H. Crisp.

Kindred, J. E. Cyclopia completa and arhinencephalia completa with umbilical hernia in a full-term child. *Arch. of Ophth.*, 1945, v. 33, March, pp. 217-223.

Description of such a child, born to two Negroes, is correlated with a

monographic dissertation on the literature of similar cases.

The monster was of the extremely rare type in which there is absolutely no trace of a nose. Yet aside from this defect and the presence of the cyclopean eye the face showed only a slight degree of abnormality. (2 photographs, references.) R. W. Danielson.

Krafka, Joseph, Jr. Cyclopia and arhinia. *Arch. of Ophth.*, 1945, v. 33, Feb., pp. 128-136.

Two cases of cyclopia are described, one of a human infant and one of a kitten. The bones were studied roentgenographically and by the clearing method to determine the role of the premaxillas in lip formation. The current theories on the mechanics of cyclopia are discussed. They fail to disclose the factors responsible for development of various grades of cyclopia and associated oral and nasal defects. The author advances the concept that cyclopia and related defects may be caused by fusion of the two plexuses representing the first aortic arches. Should these plexuses fuse across the midline of the body, they could produce a traction factor against which the optic rudiments, in their movement from the midline, would have to act. This simple mechanical factor could produce conditions capable of bringing about all grades of cyclopia.

With the primary factor of cyclopia once established, a single median eye may be directed toward the head ectoderm at three levels: (1) below the site of formation of the nasal placodes; (2) at the level of the site; and (3) above this level. In the first instance, a nasal snout may develop above the eye and a harelip also be present. In the second instance the snout may lie above the eye and a typical premaxilla and a

tuberculum be present. In the third instance the snout may lie below the eye or be completely suppressed. (5 figures, references.) John C. Long.

Lemos Torres, Ulysses. The ocular apparatus in hyperthyroidism. *Arquivos Brasileiros de Oft.*, 1944, v. 7, nos. 4 and 5, pp. 143-163.

The very numerous ocular signs to which the names of various authors have been from time to time attached are briefly described and reviewed, more particularly the following signs: Dalrymple, Berger, Graefe, Kocher, Moebius, Joffroy, and Saenger. A number of these signs are illustrated by means of 16 photographs of patients. (Bibliography.) W. H. Crisp.

Rundle, F. F., and Wilson, C. W. Asymmetry of exophthalmos in orbital tumor and Graves's disease. *The Lancet*, 1945, v. 248, Jan. 13, p. 51.

Statistical study of 21 cases of orbital tumor and 26 cases of Graves's disease showing ophthalmic signs revealed that the presence of unilateral exophthalmos in Graves's disease is not uncommon. A 6-mm. difference in symmetry as determined by the Hertel exophthalmometer was never exceeded. As to tumors on the other hand, this figure was exceeded by 80 percent of the cases. Early attendance at a hospital by tumor patients would obviously make such a general statistical approach invalid.

From experiments on the degree of proptosis produced by injection of wax retrobulbarly post mortem, a curve was established indicating in the early stages an exophthalmos of 1 mm. for each 0.75 c.c. increase in bulk. Above this the ratio was almost 1 mm. per c.c. This affords a relatively accurate estimate of bulk of retrobulbar tumors.

Applying this to the series, it was found that the average volume of tumors was 7.5 c.c., with an approximate range of 3.3 to 14.0 c.c. In ophthalmic forms of Graves's disease, the average bulk excess on one side was 1.6 c.c. with an upper limit of 4.3 c.c. Owen C. Dickson.

Terry, T. L. Retrolental fibroplasia in premature infants. 5. Further studies on fibroplastic overgrowth of persistent tunica vasculosa lentis. *Arch. of Ophth.*, 1945, v. 33, March, pp. 203-208; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42.

This is the fifth paper in a series of studies by the author. In the cases in this study it has been observed that when no complications arise the opaque tissue making up the retrolental fibroplasia usually becomes less dense, so that in places a red reflex can be obtained and in some instances the fundus can be observed in detail. The edges of the opaque tissue may appear sharp, but usually when viewed with a slit-lamp the fibrillae are gradually reduced in number and density and finally disappear, like the edge of a fleecy cloud.

With favorable development, the searching nystagmus so typical early in the disease tends to abate and even disappear, and internal strabismus develops frequently. In most of the patients the improvement has been only moderate. Although it is apparent that infants with this condition are conscious of light stimulation and that some of them see relatively large objects which present great contrast, there is no evidence of ability to judge distance, because these infants never reach for the objects, as do seeing infants of the same age.

There seems to be no correlation between retrolental fibroplasia and

retardation in mental development of premature infants. Development of glaucoma was observed in five cases. There is a strong tendency toward development of posterior synechia. In an attempt to prevent this, a mydriatic which is effective for only a few hours was used once each week.

The original concept, that the disease arises through hypertrophy of the intraocular vascular system because of a precociously high blood pressure resulting from premature birth, seems less tenable as the factors are examined more minutely.

In approximately 12 per cent of all premature infants weighing three pounds (1,307 gm.) or less at birth retrolental fibroplasia develops. Occasionally, cataractous development may obscure deeper ocular changes. The "fetal blue" color of the iris persists longer, its speed of disappearance being in direct proportion to the rapidity of growth of the involved eye. Radiation therapy has proved to be valueless, or in fact more damaging than beneficial.

The more tenable theory of the cause of this anomaly is that failure of production or accumulation of aqueous humor may be caused by precocious exposure to light, activating the musculature of the iris and ciliary body before the hyaloid vascular system has disappeared. A surgical attempt to establish new vascular connections between the ciliary body and the episclera, by scleral trephining over the ciliary body, appears to produce some improvement. (3 figures, references.)

R. W. Danielson.

14

#### EYELIDS AND LACRIMAL APPARATUS

Amendola, Francisco. The presence of leprotic lesions in the lacrimal

gland. *Arquivos Brasileiros de Oft.*, 1944, v. 7, nos. 4 and 5, pp. 177-179.

Brief description of a clinical case is accompanied by a good photomicrograph showing the lacrimal gland with interstitial - lepromatous infiltration. According to the writer, the lacrimal gland is almost always the seat of specific lesions in cases of leprosy, and extirpation of the gland is frequently very beneficial to the patient. In only three out of twenty cases in which the gland was extirpated were the microscopic findings negative for leprosy.

W. H. Crisp.

Law, F. W. Acute recurrent lacrimal diverticulitis. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 295-301.

A patient 18 years of age had repeated attacks of acute dacryocystitis which discharged through the skin. Three weeks after the first attack the duct was syringed and was found to be freely and painlessly patent. After the second attack five months later, the passages being still patent, the author made a diagnosis of diverticulitis.

Roentgenograms made with opaque substances confirmed the diagnosis. The diverticulum was dissected out and the sac was again found patent. Several months later another attack of dacryocystitis with patent ducts led to diagnosis of another diverticulum. This second diverticulum was found to be posterior. After its removal the ducts and sac remained patent. (3 figures.)

Beulah Cushman.

Pereira, R. F. Mycotic lacrimal canaliculitis. *La Semana Méd.*, 1945, v. 52, Feb. 8, pp. 284-287.

The author has seen five cases of this condition in the course of 17 years. The clinical picture is dominated by

suppuration, and in the early stages the disease is easily confused with chronic catarrhal conjunctivitis. Three cases are described in detail. In one of these one eye only was involved, in the other two cases both eyes. The author favors slitting of the canaliculus, although not in its entire length, and curettement of the lining. Various incidental organisms are found, but special technique is necessary in order to show the fungus. In the author's three cases, the organism belonged to the subfamily Mycotoreuleae (genus *candida*). (One illustration, references.)

W. H. Crisp.

Strada, F., and Maffrand, R. A. Supernumerary lacrimal caruncle. *Arch. de Oft. de Buenos Aires*, 1943, v. 18, Feb., p. 63.

The authors report the case of a 40-year old man who showed in the lower tarsal conjunctiva of the left eye, 2 mm. below and to the temporal side of the lacrimal punctum, a small mass similar to but slightly smaller than the normal caruncle, with many whitish papillae and short white hairs over its surface. Histologic examination confirmed its similarity to the normal tissue of the caruncle. This patient had other stigmata, such as deafness and arrested mental development. The authors discuss the rarity of the condition, of which they have been able to find only six cases reported in the literature. (Illustrations, bibliography.)

Plinio Montalván

Torres Estrada, A. Simplified technique for dacryocystorhinostomy. *Jour. Internat. College Surg.*, 1944, v. 7, March-April, pp. 147-159.

The author recommends, and describes in great detail, his personal method of external dacryocystorhinos-

tomy, for which he claims much greater simplicity and brevity than is possessed by the Dupuy Dutemps operation. The suture between the interior of the nose and the wall of the sac is introduced via the endonasal route combined with an external approach. The article is splendidly illustrated, 19 of the 26 illustrations being pen-and-ink drawings to show the ten steps of the operation. W. H. Crisp.

Wetzel, J. O. Dacryocystitis: the part played by syphilis in its etiology. *Amer. Jour. Ophth.*, 1945, v. 28, May, pp. 511-516. (Bibliography.)

## 15

### TUMORS

Benedict, W. L. Diagnosis of orbital tumors. *Jour. Amer. Med. Assoc.*, 1944, v. 126, Dec. 2, p. 880; also *Trans. Sec. on Ophth.*, *Amer. Med. Assoc.*, 1944, 94th mtg.

This article is packed with information and cannot be completely abstracted. Tumor of the orbit produces exophthalmos. There is usually lateral displacement of the globe, unless the tumor arises in the nerve or the posterior third of the orbit. If exophthalmos is bilateral the case is usually one of hyperthyroidism or Mikulicz's disease. Visual loss is diagnostically of great importance only when it occurs early in the disease, bespeaking a lesion either near the optic foramen or in the nerve itself. Bruit and thrill over the orbit are diagnostic of arteriovenous aneurysm. Lesions about the optic chiasm, such as pituitary tumor, may cause obstruction to blood flow through the cavernous sinus, resulting in some exophthalmos. Loss of visual acuity with preservation of peripheral field strongly indicates posterior orbital

or chiasmal lesions. Pressure on the posterior globe may produce wrinkling of the retina. X ray is often helpful in diagnosing osteomas, or the hyperostosis of the sphenoidal ridge in intracranial meningiomas. Erosion of the orbital walls may indicate pulsating aneurysms and pyoceles of the sinuses.

The author stresses the fact that retrobulbar exploration with a trochar is diagnostically useless, and is very dangerous if the condition be malignant or an aneurysm. Digital exploration is also useless. Exploration for diagnosis should only be done through an incision so large and so placed that if a removable tumor be found it can be taken out at once.

Robert N. Shaffer.

Hughes, E. B. C. Selected cases illustrating the value of quantitative perimetry in neurosurgical diagnosis. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 143-146.

The value of quantitative perimetry is emphasized by the author in cases demonstrating typical defects of chiasmal interference, retrobulbar tumor, acquired tritanopia, and neoplasm in the posterior fossa. (Fields.)

Beulah Gushman.

Hughes, L. W., and Ambrose, A. Retro-orbital adrenal rest tumor. *Jour. Amer. Med. Assoc.*, 1944, v. 126, Sept. 23, p. 231.

A woman aged 21 years complained of exophthalmos progressive for five years. She had been struck in the eye with a hard snowball at about the time of onset of the condition. A retro-orbital tumor was removed surgically. It was roughly the size and shape of an olive and was encapsulated. Microscopic examination led to the diagnosis of an adrenal rest.

Robert N. Shaffer.

Laborne Tavares, C., and Tarcisco Castro, J. Cornu cutaneum of the upper lid. *Ophthalmos*, 1944, v. 3, no. 3, pp. 259-261.

The patient was a woman aged 91 years, who came complaining that for about a year she had had a small hard tumor in the upper lid. The horn was about 20 mm. long, slightly flattened in the anteroposterior relation, its proximal one-fourth forming a broad base attached by a pedicle to the middle third of the anterior surface of the lid midway between the orbital sulcus and the ciliary border. It was curved in such a way as to touch with its free lower end the pupillary area of the cornea. (2 illustrations.) W. H. Crisp.

Rundle, F. F., and Wilson, C. W. Asymmetry of exophthalmos in orbital tumor and Graves's disease. *The Lancet*, 1945, v. 248, Jan. 13, p. 51. (See Section 13, Eyeball and orbit.)

## 16

### INJURIES

Bonsib, R. S. Ocular lesions due to industrial toxic compounds. *Sight-Saving Review*, 1943, v. 13, no. 4, p. 257. (See Section 18, Hygiene, sociology, education, and history.)

Bromley, J. F., and Lyle, T. K. An apparatus for localizing foreign bodies in the orbit. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 164-176.

The instrument described can be used at the bedside of the patient. It requires a minimum effort of coöperation. The only "X-ray generating set" necessary is the simplest type of portable unit.

A stereoscopic pair of films are made, with a "known opaque body" introduced in relation to the anterior plane of the cornea on the affected side. All

calculations are reduced by graphs. (7 figures.) Beulah Cushman.

Carlisle, J. M. Industrial first aid in chemical injuries of the eye. *Sight-Saving Review*, 1943, v. 13, no. 4, p. 277. (See Section 18, Hygiene, sociology, education, and history.)

Carson, L. D. Ocular effects of altitude flying and of deep-sea diving. *Arch. of Ophth.*, 1945, v. 33, March, pp. 173-176.

This paper deals with changes brought about by alterations in atmospheric pressure and oxygen pressure, by rapid and severe changes in temperature, and by protection of the eyes against glare, air blast, dust, and flying debris.

The physiologic effects of variations in pressure express themselves in the following ways: by increase or decrease in oxygen pressure; by rapid decompression of the envelope of air around the earth, resulting in escape of inert gases from solution in bodily fluids and tissues in the form of bubbles, or air emboli; and through the toxic effects of oxygen.

Certain effects of even slight or low-grade anoxia are reflected in vision to some degree. Prolonged flight at an altitude of 8,000 to 10,000 feet (2,600 to 3,300 meters) causes slight but measurable impairment of retinal response, such as can be demonstrated by diminished perception of low-contrast images, increased threshold of light sensitivity as demonstrated by the adaptometer test, and impaired flicker-fusion response. Slight anoxia has such a definite effect on the sensitivity of the retinal rods that military fliers are advised to cut in their supply of oxygen from the ground on up in combat flying at night. In runs in the low-pressure chamber to simulated high altitudes

without added oxygen, reduction in visual acuity has been observed in 28 to 65 percent of persons tested; color vision has also been impaired. Diminution of sensitivity to red is less than to green or to blue. Even mild anoxia has been shown to cause a considerable increase in the total area of the normal blind spot. In "ascents" in the low-pressure chamber to the equivalent of 19,000 feet (6,000 meters), the area of the blind spot has been found to increase as much as  $2\frac{1}{2}$  times. Diplopias, scotomas, and amaurosis occasionally result from sudden reduction of pressure and release of inert gases from saturation.

At upper atmospheric levels severe sunburn frequently occurs because of exposure to ultraviolet rays. But it has been generally observed that the tolerance of the unprotected eye is apparently considerably greater than that of the skin and of the mucocutaneous junctions. Goggles should be comfortable, should give adequate protection from flying material, and be non-shatterable, and should be well integrated with the oxygen mask. A wide view is essential. An interesting discussion by Berens is based on experiences in the first World War. (1 reference, 1 graph.)

R. W. Danielson.

Cogan, D. G., and Grant, W. M. An unusual type of keratitis associated with exposure to n-butyl alcohol (butanol). *Arch. of Ophth.*, 1945, v. 33, Feb., pp. 106-109.

Butanol, to which have been added varying amounts of diacetone alcohol and denatured alcohol, was used as a solvent in cementing waterproof raincoats. It is apparently capable of causing a typical and hitherto undescribed ocular lesion. Thirty-five women engaged in the cementing process were

examined for evidence of ocular disturbance, and 28 were found to have characteristic and symmetrical corneal lesions. The outstanding symptoms were foreign-body sensations, epiphora, and burning. Less regularly noted were blurring of vision with itching and swelling of the lids. Only occasionally had the patients noted redness of their eyes.

Usually, no corneal change could be seen without the slitlamp, but in the more severe cases a slight haziness could be detected grossly on oblique illumination. Uniformly the epithelium was studded with fine dots, which appeared gray with direct illumination but upon transillumination were seen to be clear vacuoles. They were limited to the palpebral fissure and were especially numerous in the central portion of the cornea, and varied in number from between 10 and 20 in the mild cases to between 500 and 1,000 in the severest. Only rarely was there any punctate staining with fluorescein. When the patients were away from work, the corneal changes improved considerably in five to seven days and, even in the most severe instances, were completely resolved within ten days. Upon re-exposure the corneal changes reappeared within a few days.

The butanol-vapor concentration of the air was determined in various sections where the affected persons were working, and was found to vary from 15 to 100 parts per million. The maximum concentration corresponded to the area with the largest number of affected employees. The obvious therapy is improved ventilation in the plants. Attempts to produce characteristic lesions by exposure to high concentrations of the vapor failed when mice, guinea pigs, rabbits, and dogs were used as subjects. (References.)

John C. Long.

Davidson, W. G., and Burn, J. K. A. Gas-gangrene infection of the eye and orbit. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 375-377.

A patient with multiple wounds due to explosion of a hand grenade received a small perforating injury of the eye and a deep one in the orbit. Expectant treatment seemed to be satisfactory for four days, but it then proved necessary to enucleate the eye. There was no odor from the orbit, but an odor was obtained when the sclera was opened. Antigas serum was given intravenously and intramuscularly. The next day the orbital tissues were tense and swollen and blood-stained fluid trickled through the orbital wound. X-ray examination of the skull showed circular areas which were interpreted as bubbles of gas deep in the orbit. Complete exenteration of the orbit was done and the patient recovered promptly. Beulah Cushman.

Neame, Humphrey. A case of mustard gas keratitis treated with curettage of the cornea for the removal of a band-shaped crystalline deposit. *Brit. Jour. Ophth.*, 1945, v. 29, Feb., p. 102.

A transverse band across the pupillary area of the cornea, composed of a superficial deposit of glistening crystalline appearance, was curetted under local anesthesia in a patient aged 56 years, with a severe mustard-gas keratitis. The cornea healed uneventfully, and with a contact glass the vision was improved from 6/60 to 6/36. The case is reported because such corneas have been considered unsuitable for operation, by reason of their tendency to recurring ulceration.

Edna M. Reynolds.

Rycroft, B. W. Penicillin and the control of deep intraocular infection.



Brit. Jour. Ophth., 1945, v. 29, Feb., pp. 57-87.

As a result of experience in three campaigns, the following measures are recommended for the prevention of ocular infections: provision of anti-mine visors for selected troops; early attention to ophthalmic cases by forward general surgeons; early magnet applications and removal of intraocular foreign bodies from entry wounds, excision of prolapses and closure of wounds by skilled ophthalmic surgeons, insufflation of powdered calcium penicillin in every case of penetrating wound of the eye, air evacuation to a base ophthalmic wing. On arrival at a base ophthalmic wing, the following special measures are taken: complete radiographic investigation and localization followed by surgical removal of intraocular foreign bodies, sulfonamide therapy, nonspecific foreign-protein therapy, penicillin therapy, surgical treatment.

For metallic intraocular foreign bodies, direct magnet approach is used. Superficial stony foreign bodies which can be dislodged readily are removed and the wounds are carbolyzed. This procedure has to be repeated as the case progresses. All cases of intraocular foreign body are given a course of sulfonamide therapy as a routine. A total of 37 gms. is given at four-hour intervals for three days. Sulfathiazole is the drug of choice except where there is reason to believe that the skull has been opened, in which case sulfadiazine is preferred because of its excretion into the cerebrospinal fluid.

For nonspecific foreign-protein therapy T.A.B. vaccine is preferred. An initial dose of 50 to 75 millions is given and this is repeated after three days. More than two doses are rarely re-

quired. Heavier doses may produce herpes of the cornea. Protein shock is never given coincidentally with a course of sulfonamides, because the sweating which results from the protein shock may cause dangerous concentration of sulfonamides in the urine.

As a result of widespread use of penicillin in ocular conditions, the following conclusions have been reached: (1) Penicillin is of great value for superficial infections of the conjunctiva and orbits. (2) Penicillin effectively prevents infection of the conjunctiva when used early after operation. (3) Its routine application by forward ophthalmologists results in the arrival of cleaner eyes at the base. (4) Penicillin has no great value in the treatment of corneal ulcers unless these are secondary to conjunctivitis. For superficial infections of the eye the value of penicillin is well proved but for deep infections its role is preventive rather than curative.

Experiments aimed at obtaining information as to whether penicillin enters the media of the eye when given by intramuscular injections were carried out with moribund patients. It was found that when penicillin was injected intramuscularly it did not pass into the eye in amounts sufficient for detection. Direct injections of sodium-penicillin solution (1,000 units per minim) into the aqueous or vitreous were not found to influence the course of deep infections of the eye. (5 diagrams, tables, references.)

Edna M. Reynolds.

Scherling, S. S., and Blondis, R. R. The effect of chemical-warfare agents on the human eye. The Military Surgeon, 1945, v. 96, Jan., p. 70. (See Amer. Jour. Ophth., 1945, v. 28, May, p. 571.)

Stern, H. J. Transparency of the lens following traumatic cataract. *Brit. Jour. Ophth.*, 1945, v. 29, Jan., pp. 48-50.

The author reports a case of anterior capsular cataract in a West African Negro aged 25 years, whose left eye had been injured by a flying particle of stone. The uninjured eye showed a similar cataract. Both fundi were clearly visible and vision was 6/6 in both eyes several hours after the injury to the left eye. The only injury found at that time was a corneal abrasion of the left eye. Three days later, the patient returned with complaints of violent pain in the injured eye. A brilliant white mushroom-shaped mass was seen protruding from the lens into the anterior chamber. There was marked ciliary injection and the intraocular pressure was 40 mm. Hg. X ray of the eye showed no radiopaque body. The tension could be lowered by massage and hot applications. On the sixth day, the opaque lens masses had markedly diminished in size, and by the following day they were less than half the original size. The normally transparent lens was visible behind them. Thirteen days after the injury only a few fine grey capsular opacities were left, surrounded by brown iris pigment. At this stage, a feathery posterior capsular cataract was observed, the vision being 6/60. This cleared up almost completely and on the 23rd day the eye was again white and perfectly normal except for the unchanged anterior capsular cataract and a fine central corneal opacity. With the slitlamp, fine linear opacities could be seen in the anterior capsule. Vision was 6/6 and retinoscopy revealed emmetropia.

The difficult features to explain in this case are the delay of three days in the appearance of the lens masses in the

anterior chamber, the complete closure of the tear in the capsule after the loss of cortex, and the normal refraction after absorption of part of the lens. (5 figures.) Edna M. Reynolds.

Tisher, P. W. Industrial injuries of the eye caused by flying objects. *Arch. of Ophth.*, 1945, v. 33, Feb., pp. 152-154.

Corneal foreign bodies of the so-called hot-chip type, encountered in grinding vary in their characteristics with the promptness of treatment. If seen very early, the foreign body may be cleanly removed leaving only a small corneal defect. If removal is delayed, a rust ring will be present which requires thorough removal. If seen still later, there may be an infected crater. The author does not patch most eyes after removal of a foreign body. If the crater is infected, sulfadiazine powder may be applied directly to it.

The author describes ocular injuries resulting from a blow to the eye or adnexa. Intraocular foreign bodies are briefly discussed. In each case of ocular injury the vision should be recorded with and without glasses and a careful study of the fundus made. The ideal program would be to have the visual status of every employee recorded before beginning employment. This would result in the most efficient job placement and would also serve for estimating liability in case of an accident. John C. Long.

## 17

### SYSTEMIC DISEASES AND PARASITES

Ameriso, José. Oculo-orbital complications of sinusitis. *Rev. de Otorrinolaringologia* (Chili), 1944, v. 3, March, pp. 213-221.

Five clinical cases are reported. The

conditions presented were as follows: right pansinusitis with foci of osteomyelitis of the superior maxillary bone; chronic right pansinusitis not submitted to operation in a patient aged 62 years; right pansinusitis and a pyocele of the frontal sinus on the same side, with exophthalmos; orbital cellulitis in a boy of 11 years, arising from acute antro-ethmoiditis. (2 illustrations.)  
W. H. Crisp.

Boshoff, P. H., and Grasset, E. Two unusual tuberculomas. *Arch. of Ophth.*, 1945, v. 33, March, pp. 209-210.

Two cases are reported in South African Negroes. The first involved the conjunctiva and developed after an injury to that structure. The second is unusual in that an intraocular tubercle eroded through the sclera and ruptured externally with resulting degeneration of the eyeball. (2 figures, references.)  
R. W. Danielson.

Gregory. A résumé of ophthalmic findings in nutritional investigations. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 316-320.

The author reports on eye findings in vitamin deficiencies as found in routine examination of 898 patients, from town and country, from factories, some medical and college students; some members of a boys' institution, and some pregnant women. Twenty-five of the number had vascularization of the cornea compatible with ariboflavinosis. Forty-six showed wrinkling of the conjunctiva and poor dark adaptation as part of a probable vitamin-A deficiency. The pregnant women appeared excellently nourished. Of the whole group, less than 2.5 percent showed probable ariboflavinosis and a still smaller percentage showed any vitamin-A deficiency. (One table, references.)  
Beulah Cushman.

Harris, H. J. Brucellosis. *Arch. of Ophth.*, 1945, v. 33, Jan., pp. 56-61.

Brucellosis is an infectious disease of manifold symptoms. The eye is one of the many sites of its manifestations, although the disease is rather rarely recognized through its ocular signs. Acute and chronic forms alike are second to no other disease, syphilis not excluded, in the ability to masquerade under innumerable guises. From practically all the tissues of the body, as well as from the blood, spinal fluid, urine, and stool, the organism has been cultured by one or more investigators.

The literature mentions such eye manifestations as recurrent phlyctenular conjunctivitis and corneal ulcer, optic neuritis, iritis, panophthalmitis, choroiditis, papilledema, palsy of ocular muscles, and keratitis. Orloff has commented that the ocular infections associated with brucellosis seem to have great similarity, clinically as well as pathologically, to ocular tuberculosis.

The diagnosis is made by evaluation of multiple procedures including agglutination, intradermal, and opsonocytotoxic tests, and culture. Treatment is by sulfonamides, by vaccine, and by immune serum. Penicillin, or other mold derivatives, may ultimately prove to be the uniformly effective agent, although to date these preparations have given no promise of being effective in gram-negative bacillary infections. Three cases of iritis with arthritis, thought to be due to brucellosis, are reported. (References.)  
R. W. Danielson.

Heath, P., and Zuelzer, W. W. Toxoplasmosis. *Arch. of Ophth.*, 1945, v. 33, March, pp. 184-191.

Toxoplasmosis is a recently recognized infectious disease in human beings. Four principal types have been re-

ported: a granulomatous encephalitis, usually of congenital origin and occurring in fetal or early infantile life; an acquired acute encephalitis occurring in children; an acquired acute disease resembling Rocky Mountain spotted fever, and occurring in adults; a latent subclinical form occurring in adults.

In infants the central nervous system is especially susceptible to toxoplasmic infection. The principle clinical findings are internal hydrocephaly or microcephaly, roentgenographic evidence of focal cerebral calcifications, and bilateral chorioretinitis, which attacks particularly the central area. The pathologic lesion in the central nervous system consists of necrosis followed by calcification and by a tendency to form granulomas. Scattered through the hemisphere and into the white matter are found miliary granulomas with epithelioid cells, and focal meningeal and cerebral inflammatory areas with lymphocytes, plasma cells, glial cells, large mononuclear cells, histiocytes, eosinophiles, some capillary hypertrophy, and conglomerate foci of necrosis, ranging from microscopic dimensions to several centimeters in size. Cavities may be formed. Parasites, intracellular and free, may be seen in affected or clear areas. Calcium forms early and is characteristically present in older lesions.

Complete case reports of infant twins are given. Early ocular lesions were demonstrated and are thought to have originated in the seventh fetal month. The cases demonstrate the destructive affinity of the toxoplasma for young nerve tissue, especially that of the eye.

The conceptional age, the virulence of the parasite and the special susceptibility of tissue may influence the distribution and the severity of the disease. In the future, other parasites

may be found to produce lesions similar to those of toxoplasmosis; hence the importance of a study of the parasite. The cases here reported offer strong evidence for transplacental infection. (5 figures, references.)

R. W. Danielson.

Laborne Tavares, C. Laurence-Moon-Bardet-Biedl syndrome. *Ophthalmos*, 1944, v. 3, no. 3, pp. 250-261.

The patient whose case is described in connection with a general discussion of the subject was a man of 46 years, married, a public official, weighing when first treated about 260 pounds, with a divergent squint of the left eye, and complaining of nocturnal blindness from the age of 14 years. The vision of the right eye amounted to counting fingers at 60 centimeters, unimproved by correction; that of the left eye was of shadows close to the face, unimproved by correction. The right eye had a small opacity at the center of the crystalline lens, and the retina was sprinkled with small pigmentary deposits more or less of the type seen in retinitis pigmentosa. The left eye had an irregular opacity of the crystalline lens occupying about the upper third; and the fundus resembled that of the right eye.

The patient's parents were second cousins. One of his paternal grandmothers and one of his aunts had had marked obesity. One of the patient's children had more or less nocturnal blindness. The same defect, with retinitis pigmentosa, was found in two female cousins, and a male cousin had convergent strabismus and congenital cataract. (9 illustrations, 1 genealogic tree, references.)

W. H. Crisp.

Lemos Torres, Ulysses. The ocular apparatus in hyperthyroidism. *Arquivos Brasileiros de Oft.*, 1944, v. 7, nos.

4 and 5, pp. 143-163. (See Section 13, Eyeball and orbit.)

O'Neill, Hugh. Total herpes zoster of the ophthalmic, maxillary, and mandibular divisions of the trigeminal nerve. *Arch. of Ophth.*, 1945, v. 33, March, pp. 237-244.

In relation to the ocular condition there were displayed optic neuritis, exophthalmos, keratitis profunda, and probable mild involvement of the third, fourth, and sixth cranial nerves. No evidence was found for classifying this case as one of symptomatic herpes zoster arising from another intracranial disorder. In view of the severe pain and the cutaneous herpetiform manifestations, the author decided the case was one of idiopathic herpes zoster of the fifth (complete), seventh (partial), and eighth (vestibular) cranial nerves. Three excellent photographs show the vesicular efflorescence in various stages of herpetiform cutaneous response to involvement of the geniculate ganglion and of the ophthalmic, maxillary, and mandibular divisions of the trigeminal nerve. (References.)

R. W. Danielson.

Reese, A. B. The participation of the eye in general diseases. *Southern Med. and Surg.*, 1945, v. 107, Feb., p. 61.

The article is one of the Matheson Foundation medical lectures. Uveitis receives the greatest amount of attention. The table on recent etiologic classification shows tuberculosis at the top of the list as cause of 40 percent of the cases, lues 10 percent, sarcoid, brucellosis, and focus of infection each 7 percent, and the balance as due to miscellaneous causes. The diagnosis of tuberculous uveitis is discussed in considerable detail.

Latent in the adult human, toxo-

plasmosis may be transmitted by the circulation to the fetus and is seen as a congenital infection of infants. Every infant case has shown choroiditis, the macula being especially vulnerable. Microcornea, pupillary membrane, posterior lenticonus, nevus flammeus, and cataract may occur as congenital lesions.

Sarcoid, brucellosis and rheumatoid arthritis are important factors in the causation of iritis. German measles and congenital anomalies, particularly congenital cataract, may be closely related.

The author describes Sjögren's syndrome, a keratoconjunctivitis sicca with special characteristics, as seen in some climacteric women and also some elderly women with chronic arthritis. Thyrotoxic and thyrotropic exophthalmos are contrasted. F. M. Cragie.

Robertson, J. N. Ophthalmologic lesions encountered in the tropics, with special reference to the ocular manifestations of malaria. *North Carolina Med. Jour.*, 1944, v. 5, Oct., p. 483.

Among the effects of malaria on intraocular structures the writer mentions optic neuritis and amblyopia. This is due to the action of toxemia on the optic nerve and retina, and is associated with loss of vision, either transient or lasting from several days to months. Another lesion seen in malaria is extreme pallor of the optic disc, with contraction of visual fields which however is the result of toxic spasm of the arterioles produced by quinine. An optic neuritis has been attributed to blocking of retinal and choroidal vessels by parasites and leukocytes. Multiple hemorrhages are seen peripherally, and large macular hemorrhages may occur.

Other lesions are paralysis of the abducens, and ulcers of the cornea

with recurrent iritis and preceded by supraorbital neuralgia, the whole simulating herpes zoster. Heat, humidity, glare, loss of sleep, lack of proper nutrition, avitaminosis, and excessive use of tobacco result in toxic amblyopia. Among subjective symptoms the writer mentions weakness of accommodation and convergence, muscle imbalance, scotomata, sudden or gradual loss of vision (usually unilateral), headache, dizziness, and pain in the eyeball. Among subjective findings are noticed: irregularity of pupils, retinitis of atrophic type, generalized hyperemia of retina and disc, severe progressive retinchoroiditis and uveitis, and large scotomata surrounding and including the normal blind spot. M. Lombardo.

Wilder, R. M. Nutrition and the human eye. *Sight-Saving Review*, 1944, v. 14, no. 2, p. 75.

The acute severe process of nutritional deficiency quickly leads to abnormalities in the human body and is reflected in the eye by specific lesions. But chronic malnutrition or rather minor deviation due to unsatisfactory intake of one or another of the several essential nutrients may play an equally great part in the picture of poor health. Vigor and longevity, and what is called constitution and is generally attributed to chromosomal endowment, may be influenced for better or worse through the food ingested. Heredity may prove to be merely the inheritance of a good nutritional instinct. We may reasonably expect the application of nutritional knowledge to the maternal organism during pregnancy, and its continued application to the child, to prevent much of the type of disability which is commonly diagnosed as constitutional inferiority and attributed to poor heredity. Addition of milk to the chil-

dren's diet in the British milk-school scheme has promoted better growth, better fitness, greater alertness, and bouyancy of spirit. A well-conducted study in an orphanage in Virginia proved the beneficial effect of added thiamine on learning.

Changes attributed to senility, for instance the colloid degeneration of the choroid, also often seen in younger persons, may be due to nutritional deficiency, as was pointed out by Yudkin. For senescence is a product of tissue damage. When a culture medium is regularly renewed, tissue cultures in vitro do not become senescent.

R. Grunfeld.

## 18

### HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Bahn, C. A. Ophthalmic requirements of the military services. *Arch. of Ophth.*, 1945, v. 33, March, pp. 245-246.

This supplement, showing changes for the various branches of the armed forces, is to be added to previous articles by the author (See *Amer. Jour. Ophth.*, 1942, v. 25, Nov., p. 1404; 1943, v. 26, Oct., p. 1129; 1944, v. 27, July, p. 797.)

R. W. Danielson.

Berens, Conrad. The making of an ophthalmologist. *Jour. Amer. Med. Assoc.*, 1944, v. 126, Nov. 11, p. 671.

In guiding the student of ophthalmology, stress should first be laid upon excellence of education. The author believes 1½ to two years of general internship, stressing internal medicine, should be had before starting a residency of two to three years in a good eye hospital. Basic sciences should be emphasized. The ethics of the profession should be taught and followed. Better facilities and more encourage-

ment should be given the young man to indulge in research. The young ophthalmologist should join and participate in local and national eye societies.

Robert N. Shaffer.

Berkove, A. B. Ophthalmologic statistics and experiences in a 1500-bed cantonment-type hospital. *The Military Surgeon*, 1944, v. 95, Dec., p. 466.

Eighty-five per thousand patients examined were treated for acute or chronic external eye diseases. All but three of these were returned to active duty. No trachoma was encountered. Internal diseases of the eye occurred in a ratio of about twelve per thousand cases examined, many of which could not be improved with treatment. Of these, twenty were discharged because of progressive disabling eye disease. In the entire series only one case of glaucoma was seen.

In over 7,000 refractions 5,291 pairs of glasses were provided. Fifty percent of the men requiring glasses had compound corrections about equally divided between plus and minus types. The ratio of simple myopia to simple hyperopia is about 2 to 1 in soldiers with corrections above one diopter.

Owen C. Dickson.

Bonsib, R. S. Ocular lesions due to industrial toxic compounds. *Sight-Saving Review*, 1943, v. 13, no. 4, p. 257.

The growing use of poisonous chemicals in industry presents a serious hazard to the eyes of workers. A variety of dusts, vapors, and gases of mineral, vegetable, or animal origin give rise to miscellaneous disturbances. All reasonable efforts should be made to reduce hazards by installation of necessary facilities for the prevention and elimination of atmospheric con-

taminants, and by insisting on the constant use of protective goggles and masks.

R. Grunfeld.

Byrnes, V. A. Evaluation of eye tests used in the examination of Army aviators. *Texas State Jour. Medicine*, 1944, v. 40, Aug., pp. 235-240.

An attempt is made to point to a few of the visual tasks of the pilot of a bomber in combat. The four chief functions are acuity of vision, judgment of distance, efficiency of extraocular muscles, and color perception. The different functions and advantages of near and far vision are enumerated.

M. Lombardo.

Cameron, A. J. Ophthalmic work in a British General Hospital in North Africa. *Brit. Jour. Ophth.*, 1945, v. 29, Jan., pp. 26-36.

A detailed account of procedure in the examination and treatment of ocular battle casualties in a mobile hospital is given. A method of localization by injection of opaque dyes is being worked out for intraocular foreign bodies. Several cases of injury with various types of missile are reported.

The commonest type of conjunctivitis seen was a bulbar conjunctivitis with numerous small flame-shaped hemorrhages near the limbus. The best form of treatment was found to be painting the lids with silver nitrate. Repeated examination showed that staphylococcus albus was the organism usually present. The corneal ulcers were mostly of the multiple marginal type and responded well to vitamin and dietary adjuvants. The cases of trachoma were treated with sulfonamides by mouth and silver nitrate to the lids.

Edna M. Reynolds.

Carlisle, J. M. Industrial first aid in chemical injuries of the eye. *Sight-Saving Review*, 1943, v. 13, no. 4, p. 277.

All but the most trivial injuries should be seen by the ophthalmologist. The nurse, however, especially in a small industrial plant, should have standing orders. If a chemical irritant enters the eye it should be removed by irrigation with a copious amount of clean running water. The ophthalmologist should test the contents of the conjunctival sac with an alkaloid test paper. A local anesthetic must be applied. Cold lavage compresses changed every three to five minutes for a period of one to three hours are recommended, the irrigation to be continued until a neutral reaction is maintained upon testing the secretions in the fornices. The author further describes in detail the routine treatment prescribed for acid and alkali burns of the eyes following first aid.

R. Grunfeld.

Darley, W. G. Improving the visibility of industrial tasks. *Sight-Saving Review*, 1944, v. 14, no. 2, p. 102.

The author discusses the role of lighting in industrial efficiency. Deficiencies in lighting or seeing conditions in the factory include: insufficient brightness of the work due either to inadequate overhead illumination or to lack of needed close-up lighting (or the individual working in his own shadow); low brightness-contrast between critical detail and its background (contrast may be raised by altering the reflection factor, or by directional lighting); high disturbing brightness ratios between work and its surroundings, as when an artificial light source or a bright window is in the immediate field of view, or the work is brightly lighted and the rest of the room is dark. R. Grunfeld.

Da Silva, M. A. Ophthalmology in Brazil. *Amer. Jour. Ophth.*, 1945, v. 28, April, pp. 398-400.

Davenport, R. C. Ophthalmic education. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 210-217.

Undergraduate teaching should aim to teach the future medical practitioner to be an accurate observer of the external states of the eye, and to diagnose the commoner lesions. In sixty hours of clinical teaching the student should learn the differential diagnosis and treatment of the red eye, the implications of lowered visual acuity and of visual-field loss, and how to advise on a case of squint. He should watch a little operating to get an idea of the implications.

Postgraduate teaching should be given to two different classes, one containing nonteaching, nonoperating ophthalmologists and the other the teaching and operating ophthalmic surgeons. The last mentioned should have years of apprenticeship under the best of teachers, time and opportunity for research, for reading, for travel to clinics at home and abroad, and for work in associated branches of medicine. During two years of nonresident work they should do some teaching of younger colleagues, and act as demonstrator for the surgeon. Diplomas should be granted by a central ophthalmological body. The senior teaching staff should consist of professors and a whole-time dean or director of teaching, with a whole-time staff. Beulah Cushman.

Downing, A. H. Ocular defects in sixty thousand selectees. *Arch. of Ophth.*, 1945, v. 33, Feb., pp. 137-143.

This paper consists of a tabulation and analysis of the visual defects en-



countered in the examination of 60,000 men appearing at a U. S. Army induction station. Both common and rare eye conditions are recorded to give some idea of their relative frequency. A total of 5,712 (9.5 percent) of the men examined were found to have eye defects. Strabismus was present in 2 percent. A total of 2,932 cases (4.9 percent) of monocular blindness or partial loss of visual acuity were found. Post-traumatic blindness was noted in 836 instances. Amblyopia was found in 1,920 cases, of which 855 cases did not have strabismus, 770 cases had convergent strabismus, and 295 cases had divergent strabismus. Amblyopia was responsible for 66 percent of all monocular poor vision. The author suggests that suitable preventative measures should be taken to lower the incidence of post-traumatic blindness, and that efforts should also be made toward early recognition and treatment of amblyopia. (5 tables.) John C. Long.

Foster, John. A simple method of teaching medical ophthalmology. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 233-238.

Desiring to present a comprehensive picture of ophthalmology to medical students in a form easy to remember, the author analyzed the difficulties which defeat the undergraduate in his grasp of the subject. He requested the student to "think pictorially," and to reduce what he saw in the fundus to a few set terms as given on a chart. (One figure, 3 tables.) Beulah Cushman.

Gradle, H. S. A visual service for small manufacturing plants aimed at the prevention of blindness by the elimination of industrial accidents. *Trans. Amer. Academy Ophth. and Otolaryng.*, 1944, 48th mtg., pp. 191-

194. (See *Amer. Jour. Ophth.*, 1944, v. 27, Nov., p. 1331.)

Greear, J. N., Jr. Rehabilitation of the blinded soldier. *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1944, 49th mtg., Sept.-Oct., pp. 59-62.

Since its opening as a military institution, the Old Farms Convalescent Hospital has treated 205 blinded enlisted men, of which 119 were under treatment in October, 1944. Many have injuries of other parts of the body. These men are trained to live as blinded persons in a seeing world. The first step is a satisfactory adjustment to the loss of vision, which is facilitated by an active program designed to make the patient personally independent as soon as possible. He is taught to shave, dress, and keep himself well groomed, to feed himself, to get around alone, and to care for his personal effects generally, keeping his bed and locker in order at all times. As he progresses, he learns to travel in a small town near by, and later in Philadelphia.

At the conclusion of this part of his training, there is considered the advisability of a furlough which permits a visit to friends and relatives in different parts of the country. Especially at this time, pity and maudlin sentimentality are to be avoided. Upon his return the soldier is placed on a full schedule which includes Braille, type-writing, physical education, and handicrafts. Among the latter are weaving, pottery, leather work, and plastic molding. The educational testing program through which the blinded soldier has also passed shows aptitudes that may direct future training. Better speech, with group discussions, is stressed, as are a varied social program and physical re-education. Bi-weekly progress-reports and frequent examinations

facilitate progress as far as the abilities of the patient will permit. Positions for those who are capable and so desire are secured in nearby plants.

When the soldier has proved that he is capable of carrying on in a seeing world, he is discharged and then handled by a representative of the Veterans Bureau who is familiar with placing the blind in industry and other phases of civilian life. Many of these blinded soldiers wish to continue their college education or to follow some profession. The large majority desire some mechanical job. If industry gives the blinded soldier a fair chance, he will not let industry down.

Charles A. Bahn.

Hearon, Eleanor. Future goal for the prevention of blindness. *Sight-Saving Review*, 1944, v. 14, no. 2, p. 94.

Advancement of medical science has caused a shifting of causes of blindness. The opportunity for prevention of blindness in the future lies in research into the causes of degenerative diseases. Periodic health examination should include a thorough eye examination, with a provocative test for glaucoma.

R. Grünfeld.

Kuhn, H. S. Visual job analysis and prescribing for special work distances. *The Sight-Saving Review*, 1943, v. 13, no. 4, p. 235.

The ophthalmologic consultant to an industrial plant should acquaint himself thoroughly with the specific mechanics involved in the plant. In this way he can assign each job-seeker to a working place commensurate with his visual capacity. The ophthalmologist has special problems of refraction to solve in regard to special lines of work, and near correction must sometimes be given even to young people, with care-

ful attention to the pupillary distance. If a presbyope needs near vision on rare occasions only, he may do better with a flip-up correction. Electric-truck operators or crane operators should not be given bifocals. R. Grünfeld.

Law, F. W. A faculty of ophthalmologists. *Brit. Med. Jour.*, 1945, Feb. 3, p. 160.

There is obvious need for an authoritative and representative body to guide ophthalmologists through the intricate and important problems which are to be settled in the near future, to represent their interests to the State, and to coördinate their efforts, so that in the coming reorientation of the medical service of the country the greatest good may accrue to the general populace, while at the same time the interests of the profession are protected.

The Council of British Ophthalmologists consists of the presidents and past presidents of the Ophthalmological Society of the United Kingdom, and the Section of Ophthalmology of the Royal Society of Medicine, together with nine other members. It was organized in 1918 to act in all matters of ophthalmic interest arising in connection with national industries and public services, and to initiate or advise concerning movements which have for their object the welfare of the eyesight of the community. It has recently been felt that this Council would have more weight and authority if it were more directly representative of the whole body of ophthalmologists in the country, and the Council of British Ophthalmologists has therefore decided to promote the formation of a Faculty of Ophthalmologists.

Specific functions of the Faculty are to encourage suitable standards of education and research, to secure the best

conditions of ophthalmic practice, to maintain high ethical standards, and to act as an authoritative body for consultation in public and professional matters of ophthalmic interest. Membership is to consist of ophthalmologists of full consultant status. Associates must have at least two years full-time special practice. Upon organization of the Faculty, which is now receiving applications, it will assume all the functions of the present Council of British Ophthalmologists.

Owen C. Dickson.

Livingston, P. C: *The Royal Air Force mobile eye surgery*. Jour. Royal Institute Public Health and Hygiene, 1944, v. 7, Dec., p. 319.

A six-wheel Fordson ambulance converted into an eye unit is described. In this small compact space are performed clinical examinations, the chief ophthalmic surgery expected in a war, supplying of corrective spectacles, and the study of nutritional diseases affecting the eye. The equipment includes a special Bjerrum screen to test the field of vision in complete darkness, and details of this test are supplied.

F. M. Crage.

Loewenstein, Arnold. *A central ophthalmological institute for the United Nations*. Brit. Jour. Ophth., 1945, v. 29, Jan., pp. 6-12.

The plan is for a central institute of ophthalmology from which will issue perfectly trained clinicians, with the highest standards of scientific experience, and capable of undertaking the teaching of the medical schools of the United Nations. It is recommended that a new building, centrally located, be constructed along the lines of the

newest eye hospitals in Russia or the United States.

A floor plan for an out-patient department is submitted and a schedule for staff meetings is outlined. The laboratory, library, and department of photography are described. The library should contain general medical literature of all nations as well as literature of the specialties. All of the staff should be on a full-time basis. (One diagram.)

Edna M. Reynolds.

Merewether, E. R. A. *The role of the ophthalmic surgeon in industrial health*. Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 357-359.

The author pleads that the ophthalmologist should take more interest in the causation of occupational affections of the eyes as to the following details: prevention and first aid treatment, examination of the visual state of the individual and his assignment to operations for which he is best suited, correction of errors of refraction and application of optical aids to certain difficult and fine work, standards of illumination, color vision, special nutritional factors, the relationship of eye defects to accidents, and education of the individual in use and care of the eyes.

Beulah Cushman.

Minton, Joseph. *Eye diseases in the East*. Brit. Jour. Ophth., 1945, v. 29, Jan., pp. 19-26.

A description of the eye diseases of the native population as well as of those of the British and Indian troops stationed in Iraq, India, and Ceylon in 1941 and 1942 is given. Epidemics of infective ophthalmias occur regularly every year in Iraq, Palestine, and Egypt, beginning in May and lasting

until December. The patients, mostly children, develop severe mucopurulent conjunctivitis, which is usually associated with ulceration of the cornea. This conjunctivitis is caused by a variety of organisms—Koch-Weeks, staphylococcus, Morax-Axenfeld, gonococcus and bacillus diphtheriae.

Because of the high cost and shortage of the drug, only a very small proportion of the patients with gonococcic conjunctivitis received sulfonamides. The bulk of the patients were treated with argyrol, silver nitrate, and intramuscular milk injections. Sixty percent of the population in Iraq is trachomatous. Most of the patients were treated with silver nitrate, expression of the follicles, and copper. Sulfonamides were rarely used.

The British troops showed a very low incidence of infective eye conditions. There were no epidemics of conjunctivitis among them, and only a small number of isolated cases of mucopurulent conjunctivitis occurred. Some were associated with corneal ulceration. There were no cases of trachoma among the British troops. The Indian troops had a much higher incidence of mucopurulent conjunctivitis, associated with corneal ulceration of varying degrees of severity. A large number showed signs of old trachoma. There were no cases of gonococcic or diphtheric conjunctivitis among the British or Indian troops.

Keratomalacia is common among the children of the poor Hindus of Karachi and the surrounding country. Trachoma is also prevalent, but epidemics of gonococcic or diphtheric conjunctivitis are unknown. Epidemics of Koch-Weeks and staphylococcal conjunctivitis occur regularly every summer. In Ceylon trachoma is compara-

tively rare. Epidemics of mild Koch-Weeks infection occur with the onset of the monsoon in April. Throughout the summer there are large numbers of cases of infective punctate keratitis, which often cause central scarring of the cornea. Keratomalacia occurs among the very poor.

Among the 3,000 lepers on Ceylon, the chief manifestations of leprosy in the eye were lepromatous nodules on the conjunctiva and cornea. Most of the cases were complicated by iridocyclitis. Superficial and deep keratitis without nodules of the conjunctiva or cornea also occur, and blepharitis is very common among the lepers.

A sulfonamide paste was found useful in the treatment of mucopurulent conjunctivitis. Sulfonamides were found unsatisfactory in the treatment of epidemic punctate keratitis. Vitamin-B complex and riboflavin were found useful in this condition. (References.)

Edna M. Reynolds.

Mumford, E. W. *Ophthalmological guidance for nurses in industry*. Sight-Saving Review, 1943, v. 13, no. 4, p. 282.

The ophthalmologist should guide the nurse in her work and determine the scope of eye services she is allowed to render.

R. Grunfeld.

Murray, Michael. *An introduction to Bishop Berkeley's theory of vision*. Brit. Jour. Ophth., 1944, v. 28, Dec., pp. 600-611.

A brief sketch of Bishop Berkeley's life and a summary of his theory of vision are given. His belief that space perception is learned by experience and is not inherited or instinctive is questioned by the author. Numerous cases of congenital cataract successfully op-

erated upon are reported in which postoperatively the patients were able to detect a difference in the shape of objects although unable to name it. Experiments on the visual perception of rats and chickens are reported: they show an inborn judgment for distance. From these and other similar experiments the author assumes innate organization existing in man. The evidence is considered inconclusive and the problem undecided. (References.)

Edna M. Reynolds.

Parsons, John. Ophthalmic education. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 208-209.

The author states that the teaching of ophthalmology to the undergraduate student should be confined to those portions of the subject which are essential to the general practitioner. Practitioners in ophthalmology may be divided into two classes: (1) The lower grade, which could be called "ophthalmic medical practitioners," consists of those medical men who engage in refraction work for County Councils and other bodies but do not undertake ophthalmic operations; (2) the higher grade consists of those post-graduates who propose to devote themselves to the practice of ophthalmic medicine and surgery and aspire to posts on the eye staffs of general and special hospitals. The latter grade should be open only to those who have followed a statutory course of instruction and who provide evidence of having obtained adequate experience. The curriculum for these students should include instruction on the general medical, neurologic, rhinologic, and other medical aspects of ophthalmology.

The examinations should be carried out by means of paper on optics, the physiology of vision, ophthalmic medi-

cine and surgery, and ophthalmic pathology and bacteriology. There should be a clinical examination, a practical examination in ophthalmology and ophthalmic surgery, and oral examinations. A higher diploma should be available to these students from the Conjoint Board, or by a university degree.

Beulah Cushman.

Post, L. T. The future of ophthalmology. (Presidential address.) *Trans. Amer. Acad. Ophth., and Otolaryng.*, 1944, 49th. mtg., Sept.-Oct., pp. 7-10.

Constructive planning for the future of ophthalmology is strongly advised. The public should have, and probably will have, the best of medical care at a cost within their means. Unless the medical profession does initiate the necessary measures to this end within a reasonable time, ill-advised governmental schemes will be foisted on both the medical profession and the public, to the detriment of both. Only by intelligent use of the trial and error method can the necessary adjustments be efficiently made. We must not repeat past blunders such as unwillingness to experiment with ideas simply because they do not originate within our profession. The medical and economic advantages first to the patient and then to the medical profession must be the criteria of future experiments. Based on the legitimate needs of today, there are too many major eye surgeons and too few refractionists. Educational facilities, both didactic and clinical, are needed to solve this and other problems which affect ophthalmic patients and the practitioners of tomorrow.

Charles A. Bahn.

Regan, J. J. The goal of an eye-hygiene program for school children. *New England Jour. Med.*, 1944, v. 231, Oct.

5, pp. 486-490. (See Section 3, Physiologic optics, refraction, and color vision.)

Scott, J. G. The eye of the West African Negro. *Brit. Jour. Ophth.*, 1945, v. 29, Jan., pp. 12-19.

This report is based on examinations of 1,000 Gambian school children and 1,100 Gambian, 300 Gold-Coast, 300 Nigerian, and 300 Cameroon soldiers, in addition to hospital and clinic patients seen at a West-African military hospital over a period of 18 months.

Pigmentation of the interpalpebral conjunctiva and a ring of pigment around the limbus are normal. Vascularity of the cornea beyond the ring of pigment is pathologic and is most commonly due to trachoma. This is in marked contrast to European eyes, where normally 35 percent have vascularity at or beyond the limbus. Strands of persistent pupillary membrane are more common and more gross in Negro eyes than among Europeans.

The lens, vitreous, and fundus present no special points except the rarity of congenital lens changes. The Negro fundus is red in color, not chocolate or slate gray. The visual acuity of the Negro compares favorably with that of the European.

Two-percent homatropine and cocaine are not efficient mydriatics for Negro eyes. Two-percent cocaine with 5-percent homatropine gave a modest mydriasis. One-percent atropine produced in 20 to 30 minutes full mydriasis, lasting five to ten days.

The common ocular disturbances are of the corneal nebula, most frequently caused by onchocerciasis and trachoma, and iridocyclitis, caused by onchocerciasis and trypanosomiasis, as well as by more usual diseases. Microfilariae are not uncommon in the aqueous and

are well tolerated. Many cases of onchocerciasis were found without palpable nodules, which suggests that the role of the nonencapsulated worm is important in producing the eye changes and that removal of nodules containing the adult *Onchocerca volvulus* is of doubtful value.

In contrast with Europeans, no case of chronic marginal blepharitis was seen, and only one case of phlyctenular conjunctivitis. Ophthalmia neonatorum is almost unknown in spite of the prevalence of gonorrhea. A few cases of follicular conjunctivitis and spring catarrh were treated. (References.)

Edna M. Reynolds.

Snell, A. C. Responsibility of the ophthalmologist in the industrial field. *Sight-Saving Review*, 1943, v. 13, no. 4, p. 223.

The numerous surveys that have been undertaken in the past reveal that about 20 percent of the workers have defective vision. Industrial ophthalmology has been neglected for want of sufficient number of ophthalmologists who would or could give adequate service, also through indifference of the employer and the employee alike. Neither of them was willing to assume all the cost for the examination of the eyes and for supplies, nor were the ophthalmologists ready to accept an adjusted compromise to bring their offices into the industrial plant. Another cause of neglect was ignorance on the side of the employers who did not know the importance of good vision in productive efficiency and in the prevention of both eye and other bodily accidents, and ignorance on the side of the employee who often was not aware of his visual defect and the possibility of its correction. The author stresses

a 13-point program to alleviate the existing condition. R. Grunfeld.

United Kingdom, 1943, v. 63, pp. 348-356.

Sverdllick, José. *Ophthalmology in the medicine of Hippocrates*. Arch. de Oft. de Buenos Aires, 1943, v. 18, Feb., p. 103. (See Amer. Jour. Ophth., 1943, v. 26, March, p. 340.)

Townsend, J. G. Importance of industrial ophthalmology. Sight-Saving Review, 1943, v. 13, no. 4, p. 219.

Annual injury of 200,000 eyes bears out the importance of industrial ophthalmology. Seventy percent of the accidents occur on supposedly nonhazardous jobs. We must assume that protection of eyesight through the present safety programs is inadequate. Protective goggles are used widely but not so extensively as they should be, nor is the wearing of the goggles sufficiently enforced.

Protection against accident is only part of the ophthalmologist's job. Equally important are diagnosis of eye defects, job analysis, defining visual requirements. The ophthalmologist should familiarize himself with the numerous jobs within the plant and with the visual requirements of each of them. Just as it is important to keep out of a certain job a man whose vision, muscle balance, depth perception, or color discrimination is defective, so is it equally important to find for a man with these defects a job which he can adequately perform with safety to himself and to his fellowmen. Moreover, eye conditions are often symptomatic of systemic disorders, so that the ophthalmologist can render valuable service in coöperation with the rest of the medical staff. R. Grunfeld.

Weston, H. C. Illumination and industrial efficiency. Trans. Ophth. Soc.

Recent data suggest that the illumination required is inversely proportional to the third power of the apparent size of the detail to be seen. Roughly it seems that 6/6 vision is only good enough for sustained visual work of the ordinary grade, whereas for all "fine" and "very fine" work 6/5 to 6/3 vision appears desirable.

The standard of industrial efficiency can only be maximal when conditions are made ideal for the poorest worker. The extremes of range of illumination for workers may be in a ratio of 100:1. For example, with a typical group of persons doing fine work it was found that the average performance of the group as a whole only reached a certain level when the illumination was twenty times as much as necessary for the superior half of the group to attain the same level of performance. Doubling the illumination only adds 0.15 to the acuity, and still less with illumination over 50 foot candles. (5 diagrams, references.) Beulah Cushman.

Williams, R. C. Industrial aspects of ophthalmology. Sight-Saving Review, 1943, v. 13, no. 4, p. 231.

Workers with insufficient vision, formerly rejected, must now be employed in ever increasing number. The ophthalmologist must constantly confer with the management, the safety engineer, and the staff of the medical department for study of the working conditions of the employee, to institute proper safety measures, and to diagnose and treat eye conditions related to systemic diseases. He should assist in rehabilitation of those with sight defective from injury or other causes.

R. Grunfeld.

Wilson, Duncan. Illumination in industry. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 340-347.

The author reviews legislation pertaining to lighting matters from 1913 to the present. Improvement in lighting has been made possible by greatly diminished cost and the development of the rectifier type of photoelectric cell for the purpose of measuring illumination. Experimental work has proved that visual acuity improves up to 1200 foot-candles, provided the surrounding field is adequately illuminated and there is a linear relation between visual acuity and the logarithm of illumination for certain ranges of illumination. Further study has also revealed that variations in size exert a much greater effect on performance than corresponding variations in illumination.

Beulah Cushman.

## 19

### ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Spear, F. G., and Tansley, K. The action of neutrons on the developing rat retina. *Brit. Jour. Radiology*, 1944, v. 17, Dec., p. 374.

Studies of the comparison of neutron activity (as obtained from the cyclotron) and gamma radiation were carried out on young rat retinas. In each experiment exposure to neutrons was followed by a reduction in the number of dividing cells. This initial diminution was succeeded by renewal of mitotic activity, and with doses above 5 n (1 n equals 2 to 2.5 r) this return was characterized by marked distortion of the phase ratio. In all experiments degenerate cells appeared between one and three hours after exposure to neutrons. Increase of dosage to 60 n showed considerably delayed recovery

of mitosis, differing from that of gamma radiation, which usually shows a compensatory increase to supernormal levels.

Comparison reveals that neutron radiation has a more distinct lethal action on cells than does gamma radiation, although their effect on mitotic cells is relatively the same. It seems necessary to assume that the degenerate cell count is made up partly from a direct and partly from a delayed effect of neutrons upon cells.

Owen C. Dickson.

Vidal, F., and Malbrán, J. L. Distribution of primary myelinated optic fibers in the pretectal area of the cat. *Arch. de Oft. de Buenos Aires*, 1943, v. 18, March, p. 125.

Using 24 cats of different ages, retinal microlesions were produced in some of them and one or both eyes were enucleated in others. The animals were allowed to live for periods ranging from nine days to ten months. The material was studied with the Weil and Marchi staining method as modified by Swank and Davenport. The authors conclude that in the cat the primary optic fibers of the ventral and dorso-lateral portions of the dorsal geniculate body run to the pretectal nucleus. No myelinated fibers originating in the retina end in the pulvinar of the thalamus or in the mesencephalic lentiform nucleus. No myelinated fiber of retinal origin is found in the superior colliculus. The same number of crossed and direct primary optic fibers run to the pretectal nucleus. The number of ventral fibers, however, is greater than the number of dorsal fibers. No fiber originating in the retina crosses the midline at the level of the posterior commissure. (Photomicrographs, bibliography.)

Plinio Montalván.



Vidal, F., and Malbrán, J. L. Distribution of primary myelinated optic fibers in the dorsal geniculate body of the cat. *Arch. de Oft. de Buenos Aires*, 1943, v. 18, Feb., p. 70.

In 24 cats of different ages one or both eyes were enucleated and the animals allowed to live for a period of time ranging from nine days to ten months. The specimens were studied with the Weil and Marchi staining method as modified by Swank and Davenport. The authors conclude that no myelinated fiber originating in the retina ends in the ventral geniculate body. The crossed and homolateral sensorial retinal fibers end in the ventral portion of the dorsal geniculate body. The num-

ber of crossed fibers in the ventral portion of the dorsal geniculate body is greater than the number of homolateral fibers. Most of the primary optic fibers end in the ventral portion of the dorsal geniculate body. Collateral fibers originating in the fibers of the optic tract and running to the pretectal region are observed in the ventral portion of the dorsal geniculate body. The dorsolateral fibers run to the pretectal zone, the homolateral fibers of the optic tract ending in the second and fourth layers and the crossed fibers in the first and third layers. No myelinated fibers of retinal origin end in the pregeniculate gray substance. (Photomicrographs, bibliography:) Plinio Montalván.

## NEWS ITEMS

Edited by DR. DONALD J. LYLE  
904 Carew Tower, Cincinnati 2

News items should reach the editor by the twelfth of the month

### DEATHS

Dr. Albert C. Cobb, Marion, Massachusetts, died March 21, 1945, aged 76 years.

Dr. Louis W. Flanders, Dover, New Hampshire, died January 16, 1945, aged 80 years.

Dr. John M. Foster, Denver, Colorado, died March 24, 1945, aged 84 years.

Dr. Edward R. Gookin, Washington, D.C., died March 6, 1945, aged 62 years.

Dr. George D. Hallett, New York, New York, died March 14, 1945, aged 78 years.

Dr. Samuel Hirschberg, Newark, New Jersey, died in April, 1945, aged 60 years.

Dr. Moses R. Kahn, Baltimore, Maryland, died January 11, 1945, aged 57 years.

Dr. Joseph L. Kershner, Effingham, Illinois, died March 13, 1945, aged 86 years.

Dr. Oscar L. Long, Portland, Maine, died March 9, 1945, aged 71 years.

Dr. Arthur M. MacWhinnie, Seattle, Washington, died February 28, 1945, aged 70 years.

Dr. Jason E. Montgomery, Weslaco, Texas, died January 30, 1945, aged 73 years.

Dr. Archie L. Oberdorfer, New York, New York, died March 12, 1945, aged 67 years.

Dr. Dorland Smith, Bridgeport, Connecticut, died February 5, 1945, aged 69 years.

Dr. Clarence S. Trimble, Emporia, Kansas, died March 16, 1945, aged 67 years.

Dr. Furman C. Whitaker, Bradenton, Florida, died March 8, 1945, aged 88 years.

### MISCELLANEOUS

The Council of British Ophthalmologists has sponsored the formation of a Faculty of Ophthalmologists, and the Council has now dissolved. The Council of the Faculty, consisting of regional and national representatives, was elected by ballot and at its first meeting on April 12, 1945, the following officers were elected: Brigadier Sir Stewart Duke-Elder, president; Mr. F. A. Juler, vice-president; Mr. Frank W. Law, honorable secretary; and Mr. F. A. Williamson-Noble, honorable treasurer.

The address of the Faculty is 45 Lincoln's Inn Fields, London, W.C. 2.

### SOCIETY

The annual meeting of the Milwaukee Ophthalmic Society was held May 22d at the Milwaukee Athletic Club. The following officers were nominated for the ensuing year: Dr. Ralph T. Rank, president; Dr. Meyer Fox, vice-

president; Dr. Frank G. Treskow, secretary-treasurer; and Drs. Edwin Bach, Raymond Warner, and O. P. Schoofs, directors.

At the meeting of the Washington, D.C., Ophthalmological Society held on May 28th, the guest speaker was Dr. Ernest Sheppard, who presented a paper entitled "Infranuclear paralysis of the elevators; report of two cases illustrated by moving pictures." A demonstration of the "Berman locator" was given by Mr. Samuel Berman of New York City. The following cases were presented: "Hyalitis scintillans" by Dr. C. R. Naples; "Two cases of Duane's syndrome" by Dr. M. Noel Stow; "Pigmentary degeneration of the retina" by Dr. Ronald A. Cox; and "Traumatic section of cornea healed with the aid of a conjunctival flap" by Dr. Edward G. Cummings.

The officers of the newly formed Central Illinois Society of Ophthalmology and Otolaryngology are: Dr. Watson Gailey, president; Dr. Walter D. Stevenson and Dr. Stuart Broadwell, Jr., vice-presidents; and Dr. William F. Hubble, Jr., secretary-treasurer. The membership is limited to 50 and is open to members of the national board or those eligible to membership in it. The first meeting was held in Bloomington, April 21st-22d.

Dr. Antonio Torres Estrada has been elected permanent secretary of the Ophthalmological Society of the Hospital de Nuestra Señora de la Luz, Mexico City, to replace the late Dr. Rafael Silva. Other officers of this ophthalmological society are Dr. Manuel J. Icaza y Dublan, president; Dr. Jose Martinez Moreno, annual secretary; and Dr. Jose Luis Arce, treasurer. Dr. Torres Estrada is Director of

the Ophthalmologic Hospital de Nuestra Señora de la Luz.

The Reading Eye, Ear, Nose, and Throat Society and the Reading Dental Society had a joint meeting May 16, 1945. Dr. Herbert K. Cooper, past president of the Pennsylvania State Dental Society, addressed the group. His topic was, "Cleft palate, and the correction of speech defects in crippled children."

#### PERSONALS

Major Trygve Gundersen (MC), consultant in ophthalmology to the Mediterranean Theater of Operations, is now on temporary duty in the Ophthalmology Branch, Surgical Consultants Division, Office of the Surgeon General. For the past 27 months he has served as Ophthalmic Officer and Chief of the Eye, Ear, Nose, and Throat service of the Sixth General Hospital, Mediterranean Theater of Operations.

Col. Derrick Vail (MC), Chief of the Ophthalmology Branch, Surgical Consultants Division, represented the Office of the Surgeon General at the recent Conference on Industrial Ophthalmology held in New York City under the sponsorship of the College of Physicians and Surgeons, Columbia University, in cooperation with the National Society for the Prevention of Blindness.

Dr. Frederick Andrews Kiehle has retired as professor and head of the department of ophthalmology after many years of distinguished service to the University of Oregon Medical School. Dr. Kiehle has been appointed professor emeritus and Dr. Kenneth C. Swan has been appointed professor and head of the department of ophthalmology.

# AMERICAN JOURNAL OF OPHTHALMOLOGY

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# AMERICAN JOURNAL OF OPHTHALMOLOGY

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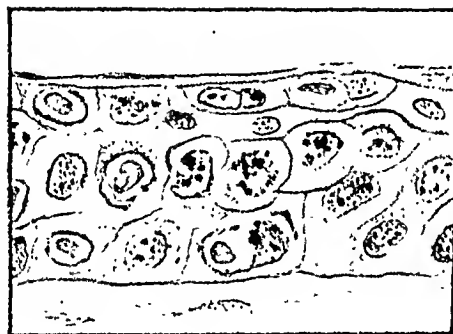


FIG. 5 (MAUMENEE, ET AL.) DRAWING OF THE MICROSCOPIC APPEARANCE OF A RABBIT CORNEA 18 HOURS AFTER INOCULATION WITH THE VIRUS FROM CASE 4, SHOWING INTRANUCLEAR INCLUSION BODIES IN THE EPITHELIAL LAYER (X1,000). HEMATOXYLIN AND EOSIN STAIN

ISOLATION AND IDENTIFICATION OF THE CAUSATIVE AGENT IN  
EPIDEMIC KERATOCONJUNCTIVITIS (SUPERFICIAL PUNCTATE  
KERATITIS) AND HERPETIC KERATOCONJUNCTIVITIS\*ALFRED E. MAUMENEE, M.D., GUY S. HAYES, M.D., AND  
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Numerous reports of sporadic epidemics of epidemic keratoconjunctivitis (superficial punctate keratitis) occurring in the Far East, Central Europe, and the United States have been published during the past 40 years. There has been much speculation and some investigation as to the causative agent of the disease. The majority of investigators think that the etiologic agent is a virus, but not until the report of Sanders,<sup>1</sup> in 1943, had any systematic attempt been made to identify the nature of the viruses which had been isolated. The present report deals primarily with the isolation and identification of two closely related but apparently different viruses obtained from the eyes of six patients who had at one time the typical clinical picture of epidemic keratoconjunctivitis.

## HISTORICAL

Hogan and Crawford<sup>2</sup> published an excellent review of the literature on epidemic keratoconjunctivitis in 1942. A few of the more pertinent reports on the subject are listed here and a composite clinical picture of the disease is described in reports of various epidemics. Von Stellwag,<sup>3</sup> von Reuss,<sup>4</sup> Fuchs,<sup>5</sup> and Adler<sup>6</sup> all described the clinical appearance of the disease in

1889. Fuchs recorded 36 cases and suggested the name "Superficial punctate keratitis." Herbert<sup>7</sup> in 1901 described an epidemic including 226 cases that he had seen in Bombay. Kirkpatrick<sup>8</sup> in 1920 recorded an epidemic that he had seen in Madras, gave a clinical description of the malady, and classified the various corneal lesions in his cases into three groups. Wright<sup>9</sup> published a further study of 3,500 cases seen in Madras from May, 1928, to January, 1930. Doggart<sup>10</sup> described 43 cases seen in England in 1934. In 1934 Kirwan<sup>11</sup> reported 1,512 cases from Bengal. Numerous cases were seen in Germany and the Balkan countries from 1932 to 1940 and were reported by zur Nedden,<sup>12</sup> Janke,<sup>13</sup> Salzmann,<sup>14</sup> and others. In 1938 Hobson<sup>15</sup> gave the first report of an epidemic in this country from the west coast. In 1941 Viswalingham<sup>16</sup> published a report of 3,521 cases from Kuala Lumpur, Malaya, and in the same year Holmes<sup>17</sup> recorded the occurrence of an epidemic on the island of Oahu, Hawaii. Hogan and Crawford<sup>2</sup> gave a detailed clinical description of the disease as they had seen it in 125 patients in the neighborhood of San Francisco in September of 1941.

Epidemic keratoconjunctivitis is characterized by an acute onset of nonpurulent conjunctivitis, enlargement of the

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Fig. 1 (Maumenee, et al.) Drawing of superficial corneal infiltrates (case 4).

preauricular nodes on the affected side, and the development of small (0.5- to 2-mm.) round grayish corneal opacities in the region of Bowman's membrane. This degree of conjunctival and corneal involvement is unpredictable from epidemic to epidemic and from patient to patient in the same epidemic. The conjunctival symptoms vary from marked glassy chemosis with small superficial hemorrhages to only slight injection of the conjunctiva. If corneal opacities occur, they usually appear from four to seven days

after the onset of the conjunctivitis, although they may develop as late as 14 days. The corneal involvement may vary from an occasional subepithelial deposit to myriad superficial punctate opacities covering the whole cornea (fig. 1). During the acute stage of the conjunctivitis, before the development of corneal opacities, the epithelium may take a superficial punctate stippling stain after the application of fluorescein. The early opacities in a classical case are small and round, and are located either in Bowman's membrane or in the most superficial part of the corneal stroma (fig. 2); they usually do not stain with fluorescein. Later they may become confluent and form nummular, oval, or ringlike opacities. In patients with severe corneal involvement, lesions are found in the deeper layers of the stroma, forming a disciformlike keratitis. The corneal changes usually resolve without residual damage within two weeks to a month after the onset, but in a few patients the corneal scars persisted during the two- to three-year period of observation. The number of patients with persistent corneal opacities varies considerably from one epidemic to another. Some patients, particularly those with severe corneal involvement, develop a mild transitory iritis with small yellow keratic precipitates. In one patient Wright<sup>9</sup> noted

Fig. 2 (Maumenee, et al.). Drawing of a superficial corneal infiltrate as seen under the slitlamp, showing the position of the infiltrate (case 4).



a small nodule at the pupillary border of the iris which he thought was a typical Koeppe's nodule. When iritis occurs, it usually subsides within a week or two with no sequelae. Cultures taken during the acute stage of the disease are usually sterile, but secondary invaders such as staphylococci and influenza bacilli can be found after a week. Smears prepared from conjunctival scrapings before the onset of secondary infection characteristically show a predominance of mononuclear cells. Reduction of the corneal sensitivity has been reported by some writers, but it is probably safe to assume that the diminution is not so constant nor so marked as it is in dendritic keratitis.

Enlargement of preauricular lymph nodes on the affected side has been found in a large percentage of the patients whose glands have been examined. The percentage of bilateral ocular involvement varies from epidemic to epidemic, but in the majority of cases the disease is unilateral. The interval between the involvement of the first and second eye is usually three days to a week. The infection of the second eye is usually not so severe as that of the first. Systemic manifestations in the form of an upper respiratory infection, slight elevation of temperature, and a feeling of malaise develop concurrently in a small number of patients.

#### ETIOLOGY

There was considerable uncertainty as to the exact nature of the etiologic agent of epidemic keratoconjunctivitis until 1943, when Sanders<sup>1</sup> isolated and identified the causative virus. Before Sanders's report was made, most writers had agreed that the probable cause was a virus. Some authors with dissenting opinions, such as Herbert,<sup>7</sup> considered a feebly staining encapsulated gram-positive bacillus as the etiologic agent; Verhoeff<sup>18</sup> ascribed the

lesions to a neuropathic origin; and Kirkpatrick<sup>8</sup> thought the disease was of parasitic and nutritional origin.

Wright,<sup>9</sup> who in 1930 was able to isolate a filter-passing agent which would produce a keratitis in human volunteers and rabbits, was the first of the advocates of the viral etiology. He was able to produce a keratitis in 5 out of 12 attempts in human subjects with conjunctival scrapings filtered through a "Kitasato candle." Kirwan,<sup>11</sup> in 1934, and Viswalingham,<sup>16</sup> in 1941 were able to transmit the disease from man to man with bacteria-free washings taken from patients' eyes; they made no further attempt to identify the filter-passing agent. Janke<sup>13</sup> in 1940 was able to produce a keratitis in rabbits in 13 out of 42 inoculations and in guinea pigs in 10 out of 15 attempts with conjunctival scrapings from patients. He stated that the corneal lesions produced in experimental animals were not identical with those produced by herpes. He concluded (but gave no evidence) that the virus he had isolated was probably related to herpes.

The identity of a specific virus as the etiologic agent of epidemic keratoconjunctivitis was established in January of 1943 by Sanders.<sup>1</sup> He was able to isolate the agent from two patients by inoculating mice intracerebrally. The virus termed the "E.K." virus became attenuated in serial passage in mice but was increased in potency when it was passed through special tissue-culture media for several generations. The specific nature of the virus was established by showing that it could be neutralized by convalescent serum of the two patients from whom the virus was isolated and by the convalescent serum of 18 patients who had had the disease in other sections of the country. He also demonstrated the development of antibodies against "E.K." virus in a human

volunteer in whom the disease had been produced by experimental inoculation with his stock virus. Neutralization tests with the "E.K." virus and antilymphocytic choriomeningitis serum, antiherpetic serum, normal human serum, immune Theiler's rabbit serum, and serum from patients with nonspecific conjunctivitis all were found to be negative. The possibility that the virus might be an aberrant form of herpes simplex was thought to be ruled out by the following facts: (1) It was not neutralized by serum of rabbits immune to herpes or antiherpetic human sera; (2) no inclusion bodies could be found in the brains of mice killed by the virus; (3) keratitis could not be produced in rabbits with the agent, and (4) the size of the "E.K." virus was established as being much smaller than herpes (25-50 millimicrons as compared to 150). His virus was also found to pass through an E.K. Seitz filter (double pads) which is supposed to retain herpes.

#### DIFFERENTIAL DIAGNOSIS

It is extremely hazardous to make a diagnosis of epidemic keratoconjunctivitis in an isolated case before the onset of keratitis. The presence of enlarged preauricular lymph nodes, negative cultures from the cul-de-sac, predominance of mononuclear cells in epithelial scrapings, and absence of a purulent conjunctival discharge are most suggestive. Only by the isolation of the virus from the eye, can one be certain of the diagnosis. The conjunctivitis described by Béal<sup>10</sup> in 1901 fulfills all but the last of the aforementioned criteria. The etiologic agent of Béal's conjunctivitis has not been isolated as yet; so it is entirely possible that the two diseases are the same or that both are caused by very closely related viruses.

Herpetic keratoconjunctivitis, which is probably not so rare as might be inferred from its infrequent description in the

medical literature, also fulfills all but the last of the criteria. The differential diagnosis rests on isolation and identification of the causative virus. Aust,<sup>20</sup> Loewenstein,<sup>21</sup> and Batignani<sup>22</sup> have reported a total of six cases of nonbacterial pseudo-membranous conjunctivitis from which they have been able to obtain a "take" on rabbits' corneas similar to that given by herpes simplex. Two of their patients in the latter stages of the disease developed a dendritic keratitis. Gundersen<sup>23</sup> in 1936 listed four cases of conjunctivitis without keratitis due to herpes; three of the patients had herpes of the lids. In 1937 Granström<sup>24</sup> described seven patients with pseudo-membranous conjunctivitis due to herpes. He was able to transmit the virus from five of the patients to the corneas of rabbits. One of the most helpful features, when it occurs, in differentiating the herpetic conjunctivitis from epidemic keratoconjunctivitis is the presence of herpetic vesicles on the lids or lid margins in the former condition.

Inclusion conjunctivitis in adults can be differentiated from epidemic keratoconjunctivitis by the presence of a purulent discharge and the finding of typical inclusion bodies in the conjunctival scrapings. Parinaud's oculoglandular syndrome can usually be distinguished clinically by the presence of a more severe conjunctival reaction and of large follicles on the palpebral conjunctiva which are frequently ulcerated.

With the development of the typical corneal infiltrates during the acute stage of epidemic keratoconjunctivitis, the diagnosis can very easily be made and need be differentiated only from herpetic keratoconjunctivitis. As will be seen in the case reports that follow, the herpes virus can cause opacities which are very similar to those seen in epidemic keratoconjunctivitis. Clinically, the differentiating factors are (1) the greater loss of corneal sensa-

tion and (2) staining of the lesions with fluorescein in herpetic infections (chart 3).

#### CLINICAL MATERIAL

Epidemics of keratoconjunctivitis such as occurred on the West Coast in 1940 and in New York State in 1942 did not appear in the Baltimore area. Only a few sporadic cases have therefore been available for study. The first case studied was in December, 1942, when a house officer on the medical staff of The Johns Hopkins Hospital developed a severe unilateral conjunctivitis with swelling of the preauricular nodes on the affected side. Cultures taken from the cul-de-sac were negative for bacterial growth, but conjunctival scrapings inoculated on the cornea of a rabbit produced a severe keratitis. After this experience, 30 patients with suspected epidemic keratoconjunctivitis were studied, and attempts were made to isolate a virus. In these 30 attempts, a virus was obtained in only 5 instances. One of the six viruses isolated here resembled Sanders's virus, and the other five appeared more like the virus of herpes simplex.

In order to compare the material isolated here with the virus isolated in New York, Dr. Sanders was kind enough to send us two samples of his material. It soon became evident from a study of the different viruses isolated and the clinical material that we were dealing with two similar but separate entities.

A brief summary of the histories and a chart (chart 1) listing the clinical manifestations of the six patients from whom a virus was isolated are given:

*Case 1.* Patient W. H. B., a white man, aged 36 years, was a clinical and research ophthalmologist in the Wilmer Institute. He had had no known contact with patients suffering from epidemic keratoconjunctivitis. This was the patient's first

attack of ocular inflammation. He had never had herpes of any type. His ocular inflammation began on March 2, 1943, and lasted until April 1, 1943.

*Case 2.* Patient J. L. F., a white man, aged 25 years, was a house officer on the private medical service of The Johns Hopkins Hospital. He had been attending several patients with virus pneumonia during the month before his ocular infection. He had never had herpes of any type, but his wife had had severe herpes of the lip 10 days before the onset of his illness. This was the patient's first attack of ocular infection. His ocular inflammation lasted from December 20, 1942, to December 31, 1942.

*Case 3.* Patient D. O., a white man, aged 24 years, was a clerk in a government office in Washington, D.C. He had never had any previous ocular infection except a mild conjunctivitis during childhood. He denied ever having had a herpes infection of any type. The patient had had no known contact with anyone who had herpes or epidemic keratoconjunctivitis. His ocular inflammation began on March 13, 1943, and lasted to April 3, 1943. Four months later, the patient developed an attack of herpetic conjunctivitis which cleared without corneal involvement in five days.

*Case 4.* Patient O. F., a white woman, aged 52 years, was a housekeeper. She worked several days a week as a volunteer in the Woman's Hospital. The patient had had no known contact with anyone who had active herpes, epidemic keratoconjunctivitis, or virus pneumonia. This was her first attack of ocular inflammation, and she did not recall ever having had herpes. Her ocular inflammation lasted from May 1, 1943, to June 17, 1943.

*Case 5.* Patient R. N., a white man, aged 38 years, a machinist, was admitted to the Osler medical ward of The Johns

CHART 1  
SUMMARY OF CASES

Cases	Systemic Symptoms	Herpes of Face	Ocular Symptoms	Cultures (c) and Smears (s)	Primary Animal Inoculations
1	Slight malaise. Enlarged preauricular lymph nodes	None	Conjunctivitis, bilateral nonstaining subepithelial infiltrates of right cornea. No loss of corneal sensation	(c) Negative. (s) Predominance of mononuclear cells	Rabbit's Cornea Negative Mouse Brain Positive (4th day of disease)
2	Upper respiratory infection. Enlarged preauricular and cervical lymph nodes	Vesicles on margin of left lower lid	Severe conjunctivitis followed by superficial punctate staining of the cornea and subepithelial infiltrates, L.E. Reduced corneal sensitivity	(c) Negative. (s) Predominance of mononuclear cells	Positive (3d day of disease) Not done
3, 1st attack	Enlarged preauricular lymph nodes	Vesicles on lid margin, R.E.	Severe conjunctivitis. Superficial punctate staining of epithelium and subepithelial infiltrates, R.E., followed by dendritic figures on cornea. Loss of corneal sensation	(c) Negative. (s) Predominance of mononuclear cells	Negative (11th day of disease). Positive (12th day of disease) Not done
3, 2d attack	Slight enlargement preauricular lymph nodes	None	Conjunctivitis, R.E. No corneal involvement	(c) Negative. (s) Mononuclear cells	Positive (3d day of disease) Not done
4	"La Grippe." Enlarged preauricular and cervical lymph nodes	None	Mild conjunctivitis, R.E. Superficial corneal infiltrates. Epithelial erosion on some. * Later developed dendritic figures in corneal epithelium	(c) Negative. (s) Predominance of mononuclear cells	Positive (5th day of disease) Positive (5th day of disease)
5	Meningococcal meningitis. Enlarged preauricular lymph nodes	Vesicles on lips and lower left lid margin	Conjunctivitis. Superficial punctate opacities, some stained, L.E. Loss of corneal sensation. Later developed dendritic figures in corneal epithelium	(c) Nonhemolytic alpha streptococcus. (s) Not done	Positive (5th day of disease) Not done
6	Enlarged preauricular lymph nodes	None	Bilateral conjunctivitis. Superficial punctate corneal infiltrates, some stained, L.E. Questionable loss of corneal sensation. None developed dendritic figures in corneal epithelium	(c) Few colonies of Staphylococcus albus (4th day of infection) (s) Mixed mononuclear and polymorphonuclear cells	Positive, L.E. (4th day of disease). Negative, R.E. Not done

\* Figures 1 and 2 are drawings of the infiltrates in cornea of patient in case 4. Similar infiltrates were observed in the other five cases.

Hopkins Hospital on July 2, 1943, with the diagnosis of meningococcal meningitis. Two days before admission, he developed a fever, headache, malaise, and stiff neck. He was started on sulfathiazole by his local medical doctor. On July 6th he developed herpes simplex of the lips and preoral region. Some of the vesicles extended up to the right side of his nose. A few herpetic vesicles were noted on the lower right lid margin. At about the same time, he developed a severe conjunctivitis of the right eye. His ocular inflammation cleared by July 19, 1943.

Case 6. Patient R. E. T., a white man, aged 25 years, operated a press drill in one of the local shipyards. He had never had an ocular infection. He had had several attacks of herpes of the lip about eight years before the onset of this illness. He had no known contact with anyone with an ocular inflammation. His ocular inflammation began on November 7, 1943, and lasted to December 30, 1943.

During the earlier part of the study, because of the similarity of the clinical picture, it was thought that all of these patients had the same disease. After a study of other cases and of the viruses isolated from these six patients, it was seen that case 1 could be classified as "epidemic keratoconjunctivitis" and the last five cases as "herpetic keratoconjunctivitis." The features which aided in the clinical differential diagnosis were the presence of herpetic vesicles or scars on the lid margin, staining of the epithelium over the corneal infiltration, late development of dendritic figures in the epithelium, and the loss of corneal sensation in the patients with herpetic infections. Quite frequently the herpetic vesicles and scars of the mucocutaneous junction of the lids could be seen only with the aid of a magnifying lens.

Grüter<sup>25</sup> and Busacca<sup>26</sup> have reported

the isolation of a herpes virus from the conjunctiva of normal eyes. The question immediately arose as to whether or not the herpes virus recovered from the last five cases might not have been an activated virus in a herpetic carrier and not the real cause of the conjunctivitis. This, however, appears to be improbable, for (1) the virus could not be isolated from two of these patients after they had recovered from their symptoms, and (2) controlled examinations of 25 patients with bacterial conjunctivitis and 50 normal individuals failed to show a virus in any instances.

#### EXPERIMENTAL

1. *Study of viruses.*—All material for mouse-brain inoculation was obtained from patients' eyes by washing the lower conjunctiva with 0.5 c.c. of Simms's "Z" solution,<sup>27</sup> which was collected and placed in sterile ampoules. To these conjunctival washings were added several scrapings from the conjunctiva made with a platinum spatula. This material was found to be sterile when cultured aerobically in nutrient broth and on blood-agar plates. Three-hundredths cubic centimeter of the washings was then inoculated intracerebrally into mice, which were kept in groups in separate jars. Inoculated mice were killed with gas as close as possible to the termination of their illness. The brains were removed aseptically, ground in a Ten. Broek tissue grinder, and a 10-per-cent emulsion was centrifuged at 3,000 r.p.m. in an angle centrifuge for five minutes. The supernatant fluid was pipetted off and either used immediately or frozen and stored. A portion of this supernatant fluid was cultured in Brewer's liquid thioglycollate medium for evidence of chance bacterial contamination.

Corneal inoculations were made in the rabbit by scarifying the corneal epithelium

with a syringe needle and rubbing conjunctival scrapings, taken from the patient's eye, directly on the cornea. The rabbits thus treated were kept in racks of individual animal cages. Passage material was obtained from the rabbits' eyes by washing the cornea and conjunctiva with 0.5 c.c. of Simms's "Z" solution. At no time during these experiments did any normal laboratory animals, kept under conditions similar to those of the test animals, become spontaneously infected.

During the first part of these experiments some of the virus material was kept in a  $-30^{\circ}\text{C}$ . ice box, but this was found to lose its potency faster than material kept at  $-70^{\circ}\text{C}$ . on dry ice. It was also observed that the viruses could be kept for as long as four to five months at  $-70^{\circ}\text{C}$ ; however, repeated thawings and freezing greatly reduced the survival time of the agent.

Conjunctival material taken from patient (case 1) on the third day of the disease failed to produce lesions on a rabbit's cornea or on the chorioallantoic membrane of fertile chicken eggs. Three mice, inoculated intracerebrally with the conjunctival washings, appeared well until the third day, when one of them became sick and showed the typical picture of roughened fur, hunched back, and lethargy described by Sanders. When touched, they moved in an overactive jumpy manner, and when spun by the tail, developed convulsions. One mouse died at the end of the third day after inoculation. The other two mice appeared sick on the fifth day. One of these two mice was killed on the sixth day after inoculation, and 0.03 c.c. of the supernatant ground-brain emulsion passed to four mice. This virus was found to maintain its potency while being carried through 27 generations of mouse-brain passage, regularly killing mice in three to five days.

After the seventh passage, serial dilutions of the brain emulsion through  $10^{-5}$  killed mice on the fifth to seventh day after injection. The supernatant fluid of a 10-percent brain emulsion was inoculated on a rabbit's cornea after the fourth and sixth mouse passages, but the material failed to produce a keratitis. A fourth attempt to inoculate a rabbit's cornea was successful in producing a mild keratitis after the 17th passage in mice. On this inoculation the ground whole brain was rubbed on the scarified cornea. The material obtained from scraping the infected rabbit's cornea was carried through two generations in rabbits. The potency of the agent seemed to be increased by passage on the cornea, so that by the third generation a very severe keratitis was produced.

The virus in case 2 was isolated on the second day of the disease by inoculating a scarified rabbit's cornea. The agent was subsequently carried through 28 generations on the cornea, 6 generations in mouse brains, and 2 further transfers on rabbit's cornea. The dilution titer of this virus was also  $10^{-5}$ ; that is, at least 50 percent of the mice died after injection of a dilution of  $10^{-5}$ .

In case 3 an unsuccessful attempt was made to obtain a virus from this patient on March 22, 1943, the 10th day of his illness, by conjunctival washings. Two days later, the 12th day of his illness, corneal scrapings inoculated on a rabbit's eye produced a severe keratitis. The virus was subsequently carried through 2 rabbits and 10 mouse transfers. The patient developed a second attack of conjunctivitis four months after his first attack of keratoconjunctivitis had cleared. At this time, a virus was isolated from the conjunctiva and passed through 3 rabbits. It seemed that this patient might be classified as a herpes carrier. Three subsequent at-

tempts were made to isolate a virus from his conjunctiva, after the second infection had cleared, but all were unsuccessful.

In case 4 the virus was obtained from the conjunctival scrapings and washings, both on rabbit cornea and mouse intracerebral inoculations. The agent was passed through eight mouse and two rabbit generations. Three mice inoculated intranasally showed no signs of illness. The patient developed a mild conjunctivitis two months after her first attack had cleared, but attempts to obtain a virus at this time were unsuccessful.

In case 5 the virus was isolated by inoculating a rabbit's cornea. It was consecutively carried through the following passages: 18 rabbits, 5 eggs, 1 mouse, 2 rabbits, 1 mouse, 1 rabbit, and 1 mouse.

In case 6 the virus was obtained from conjunctival washings on a rabbit's cornea and was transferred through three generations of rabbits.

*2. Neutralization test.* Sanders<sup>1</sup> has found a specific relationship between the virus recovered from the eyes with epidemic keratoconjunctivitis and sera of patients convalescent from the disease. However, the close correlation between the clinical picture of the patients from whom a herpes virus was isolated in this study and patients with epidemic keratoconjunctivitis suggested that further investigation should be made on the relationship of the viruses obtained from these two diseases. To this end, two series of rabbits were respectively immunized by repeated injections of (1) typical herpes virus (isolated from a patient's lip), and (2) of a virus isolated from epidemic keratoconjunctivitis (N.Y. "E.K." virus). Blood was obtained from these rabbits aseptically by heart puncture. The sera were used in the following neutralization test: Dilutions of supernatant fluid of the

fourth mouse-brain passage of the herpes virus obtained from case 3 were made from 1:5 to  $2 \times 10^{-5}$ . One-half cubic centimeter of each dilution was mixed with 0.5 c.c. of the undiluted serum to be tested, so that the final dilution of the virus ranged from  $10^{-1}$  to  $10^{-5}$ . The material was incubated for one hour at 37°C. and then placed in the ice box at 4°C. for one hour. Three-hundredths cubic centimeter of each dilution was injected intracerebrally into each of three mice. The results are shown in chart 2, A, B, and C. The herpes-immune-rabbit serum neutralized at least 1,000\* mouse doses of the herpes virus and the "E.K."-immune-rabbit sera neutralized at least 100 mouse doses of the herpes virus.

Similar neutralization tests were then done with (1) the convalescent serum from case 4, (2) with pooled convalescent serum from patients with epidemic keratoconjunctivitis obtained from Dr. Sanders, (3) the convalescent serum of a patient with severe herpes of the lips, and (4) normal serum against the "E.K." virus of case 1. The strongest dilution of the virus used in the experiment was  $10^{-2}$ . All mice inoculated with the virus plus the serum of the aforementioned patients in dilutions from  $10^{-2}$  to  $10^{-5}$  survived while the control mice (virus plus normal serum) died from injections of dilutions to  $10^{-4}$ , thus showing that these three sera, obtained from herpetic-keratitis patients, "E.K."-convalescent patients, and a herpes-labialis patient, all had approximately 1,000 neutralizing doses against the "E.K." virus.

In order to check the identity of the virus obtained from case 1, it was sent to Dr. Sanders's laboratory\* for study together with several samples of sera to be

\*We wish to express our thanks to Mrs. Alexander, Dr. Sanders's technician, for her kindness in running these neutralization tests.



CHART 2

NEUTRALIZATION OF VIRUS FROM CASE 3 BY SERUM FROM A NORMAL RABBIT, HERPES-IMMUNE RABBIT, AND "E.K."-IMMUNE RABBIT

Serum	Days After Infection	Virus Dilutions														
		10-1			10-2			10-3			10-4			10-5		
Normal Rabbit	1st	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5th	+*	+	++	-	-	+	-	-	+	-	-	-	-	-	-
	6th	D**	D	D	-	+	++	-	-	D	-	-	-	-	-	-
	7th				+	++	D	+	+		+	+	-	-	-	-
	8th				D	D		++	D		++	-	-	-	-	-
	9th							D			D	-	-	-	-	-
	10th											-	-	-	-	-
	11th											-	-	-	-	-
	12th											-	-	-	-	-
	13th											-	-	-	-	-
Herpes-Immune Rabbit	1st	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	11th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	12th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	13th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
"E.K."-Immune Rabbit (Sanders)	1st	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7th	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8th	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
	9th	-	+	++	-	-	-	-	-	-	-	-	-	-	-	-
	10th	-	++	D	-	-	-	-	-	-	-	-	-	-	-	-
	11th	+	D		-	-	-	-	-	-	-	-	-	-	-	-
	12th	+			-	-	-	-	-	-	-	-	-	-	-	-
	13th	+			-	-	-	-	-	-	-	-	-	-	-	-

\* + Indicates sick mouse

\*\* D Indicates dead mouse

tested. The virus isolated from case 1 was found to be neutralized by numerous "E.K." sera in the same degree as the "E.K." virus of Dr. Sanders's laboratory. It was also found that the herpes-rabbit-immune serum, the "E.K."-rabbit-immune serum, and the convalescent serum from patients in cases 1, 3, and 4, all had neutralizing antibodies for the New York "E.K." virus. It is clear from these experiments that the herpes virus and

"E.K." virus produce antibodies which have mutually neutralizing properties.

3. *Local and systemic immunity produced by these viruses.* Grüter,<sup>25</sup> Friedenwald,<sup>28</sup> and others have demonstrated that rabbits inoculated on the cornea with herpes virus develop an immunity to the virus. It is also well known that dermatropic and neurotropic strains of the herpes agent exist, and that corneal in-

oculations with the dermatropic strain will produce an immunity which will protect an animal against a subsequent intracerebral inoculation with the neurotropic strain. It is interesting that out of the 50-odd rabbits inoculated on the cornea with the viruses obtained from patients in cases 2, 3, 4, 5, and 6 only two rabbits died with symptoms even suggestive of central-nervous-system infection. Unfortunately, no attempt was made to isolate a virus from the brain of these two animals.

During the first part of these experiments, rabbits were inoculated in only one eye and, after two weeks to a month, the second eye was inoculated to determine whether or not the animals had developed an immunity to the virus. In the second eye, these rabbits regularly developed a mild vesicular keratitis which cleared within a week, leaving only punctate scars. The presence of the virus in these eyes was demonstrated by transferring corneal scrapings to other rabbits on the third and fourth day after inoculation, with subsequent development of a typical keratitis. Later in this study the general immunity of these animals was checked by giving them an intracerebral inoculation of 0.3 c.c. of a 10-percent uncentrifuged emulsion of herpes-infected mouse brain and all rabbits survived without evidence of illness. There was, therefore, only a relative immunity imparted to the cornea of the second eye by inoculation of the fellow eye, whereas a complete systemic immunity developed, as tested by intracerebral inoculation, after corneal inoculation. These observations demonstrate that the uninfected cornea does not attain the same degree of immunity as do the other tissues of the body. This is in accordance with the lack of corneal participation in general immunity produced by *Treponema pallidum* in rabbits, which has been demonstrated by Chesney,

Woods, and Campbell.<sup>20</sup>

To test the apparent systemic immunity produced by these herpes and "E.K." viruses, the following experiment was performed: Two rabbits were immunized to herpes of the lid and two to the New York "E.K." virus by three 0.2-c.c. intracutaneous injections of the supernatant fluid of a 10-percent mouse-brain emulsion at five-day intervals. The animals were then given three 0.22-c.c. injections of a 10-percent emulsion of uncentrifuged infected mouse brain intracerebrally to test their immunity. None of the four animals showed any undue reaction to the intracerebral injection of their respective viruses, whereas control rabbits died in from 5 to 10 days. The "E.K."-immune animals were then challenged with the virus from case 3. All animals survived without evidence of infection.

Twenty rabbits which had recovered from a keratitis produced by the viruses obtained from patients in cases 2, 3, 4, 5, and 6 were inoculated intracerebrally with 0.2 c.c. of an uncentrifuged 10-percent mouse-brain emulsion infected with herpes of the lip. All of the animals which had had a previous keratitis survived, whereas two normal control rabbits inoculated in the brain with the herpes virus died within 5 to 10 days. A similar experiment was done, using viruses from cases 2, 3, 4, and 5 as the inoculum and the aforementioned 20 rabbits as the recipients. Again all previously infected animals lived and the normal controls died within the expected time.

The cross immunity between the "E.K." and the herpes virus was studied by inoculating the virus from case 1 and the New York "E.K." virus into the herpes-immune animals. A 0.2-c.c. inoculum of the supernatant fluid of a 10-percent mouse-brain emulsion infected with the virus from case 1 killed the herpes-im-

mune animals within the same time as it did the controls. The New York "E.K." virus killed the herpes-immune animals in a 1:2,000 dilution of the supernatant fluid.

It may be concluded from these experiments that while there is some cross protection on serum-neutralization test between the herpes and "E.K." viruses, rabbits immunized to the herpes virus are not fully protected from the epidemic-keratoconjunctivitis virus. It is further evident that the viruses obtained from patients in cases 2, 3, 4, 5, and 6 are straight herpes viruses, there being complete cross protection in animals immunized with these viruses against herpes obtained from the lip.

4. *Inclusion bodies.* Thygeson<sup>30</sup> has stated that intranuclear inclusions in general are less specific for an individual virus infection than are cytoplasmic inclusions. Intranuclear bodies similar to the "Lipschütz bodies" found in herpes-simplex-infected tissue have been described after herpes zoster, varicella, virus III, and virus B infections.<sup>31</sup> There has also been considerable discussion as to whether intranuclear inclusions are a specific manifestation of virus infection or merely a chemical change in the nucleus of the cells. Various attempts have been made to produce these changes by chemical and physical methods. Olitsky and Harford<sup>31</sup> are the only workers who have produced intranuclear inclusions by chemical methods and eliminated the possibility of an activated latent virus in the animals by making a systematic search for a virus in the tissue. Duke-Elder<sup>32</sup> stated that he was able to produce intranuclear inclusions similar to herpes in rabbits' corneas by the use of ultraviolet light. However, he made no search for an activated latent virus.

An attempt was made to repeat Duke-Elder's findings with ultraviolet light in 12 rabbit eyes. A mercury-vapor quartz lamp was used as a source of ultraviolet light. The time of exposure was varied between three and five minutes at 1-centimeter distance. The eyes were removed 18 hours after exposure, fixed in Zenker's solution, imbedded in paraffin, and sectioned in the usual manner. The tissue was stained with hematoxylin and eosin. Varying degrees of karyolysis of the nuclei were noted in the sections, but in no case were "Lipschütz inclusions" seen in the nuclei. An occasional acidophilic nucleus was found, but there was no halo formation nor margination of the chromatin as is typically seen in herpes inclusions.

Typical "Lipschütz intranuclear inclusions" were produced in the corneal epithelium of rabbits infected by the herpes viruses from patients in cases 2, 3, 4, 5, and 6 (figs. 3 and 4). All inoculated eyes were removed between 18 and 24 hours after infection, fixed, imbedded in paraffin, and sectioned in the routine manner. The sections were stained with hematoxylin and eosin.

It is interesting that the "E.K." virus did not always produce a keratitis in rabbits. Sanders was unable to infect rabbits' corneas with the virus and used this as one criterion in differentiating the virus from herpes. Of the three "E.K." viruses used in the study, the virus obtained from case 1 failed to produce a keratitis by direct inoculation from the patient and also failed to produce corneal lesions after the fourth and sixth mouse-brain passages. It did cause a mild keratitis, however, after the 17th mouse passage, when a heavy inoculum of brain emulsion was used. The severity of the keratitis produced by the agent was greatly increased by serial transfer on

the cornea. Two strains of the New York "E.K." virus were used to inoculate rabbits' corneas. One of these failed to produce lesions on several trials. A second strain, however, caused a keratitis on three separate inoculations. Typical "Lipschütz intranuclear inclusion bodies" were found in the corneal epithelium of all eyes which developed a keratitis (figs. 3 and 4).

The study of inclusion bodies demonstrated that both the herpes viruses from patients in cases 2, 3, 4, 5, and 6 and the "E.K." virus produced typical "Lipschütz intranuclear inclusion bodies" in the corneal epithelium. It was more difficult to produce a keratitis in rabbits with the "E.K." virus than it was with the herpes virus, but once the former had been established in the cornea, it could be transferred without difficulty and produced the same clinical and histologic picture as the herpes virus. As has been stated, the type of intranuclear change caused by these viruses is not specific for any one virus. The changes were not found, however, after simple scarification of the cornea nor after injury of the cornea by ultraviolet light, as has been described by Duke-Elder.

5. *Filtration.* No attempt has been made to determine the exact size of the viruses by ultrafiltration experiments. The agents were tested by E. K. Seitz (double pad) fil-

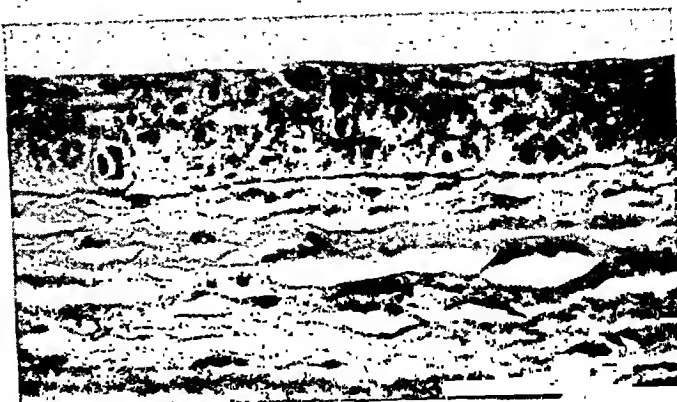


Fig. 3 (Maumenee, et al.). Photomicrograph of a section of rabbit cornea 18 hours after inoculation with the virus from case 2, showing intranuclear inclusion bodies in the epithelial layer ( $\times 375$ ). Similar intranuclear inclusion bodies were found after inoculation of rabbit corneas with the viruses from cases 1, 3, 4, 5, and 6, and also with the "E.K." virus obtained from Dr. Sanders. Hematoxylin and eosin stain.

tration, however, for it has been stated<sup>1</sup> that the herpes virus is retained by this filter and the epidemic keratocon-

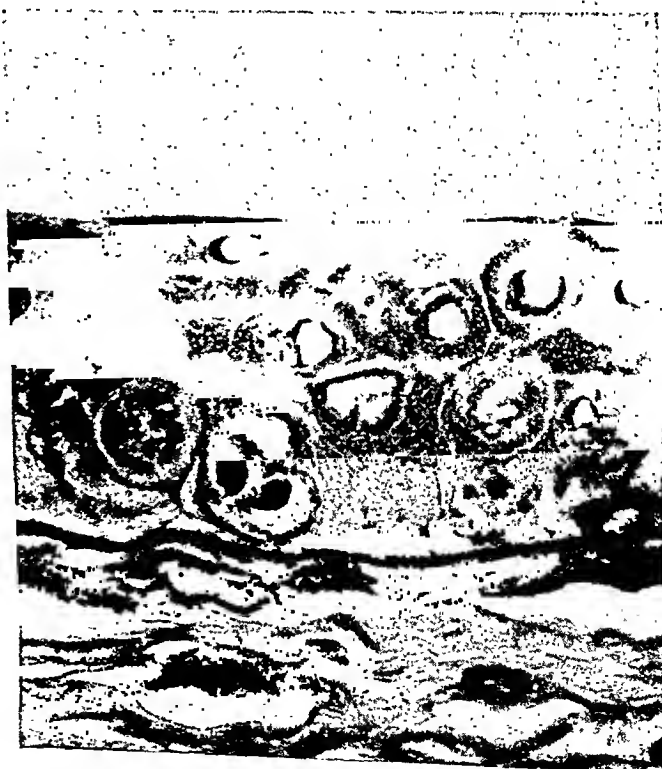


Fig. 4 (Maumenee, et al.). Intranuclear inclusion bodies in the epithelial layer of the rabbit cornea. (same as fig. 3,  $\times 1,000$ ).

junctivitis agent passes through it readily.

Filtration technique was as follows: A 1:50 emulsion of ground infected mouse brain was centrifuged at 3,000 r.p.m. for 10 minutes, the supernatant fluid withdrawn and used for filtration. The E. K. Seitz (double pad) filter was wet with 25 c.c. of Simms's "Z" solution, and 75 c.c. of a 10-percent horse-serum nutrient-broth mixture was filtered through the pads. The pads were then freed of the excess horse-serum nutrient-broth mixture by filtering 25 c.c. of Simms's solution. Approximately 15 c.c. of a 1:50 mouse-brain supernatant fluid was then filtered and the last 5 c.c. caught in a sterile test tube. The latter part of the filtrate was inoculated into mice. The second Simms's "Z"-solution filtrate was also inoculated into mice as a control. If the mice developed manifestations of cerebral infection within eight days, it was assumed the virus had passed through the filter. All filtration was done with a suction of 80 mm. of mercury.

The virus in case 1 was passed through the filter on two out of three attempts. Two trials to filter the herpes virus in case 3 gave negative results.

6. *Methylene blue.* Perdrau and Todd<sup>33</sup> have demonstrated that methylene blue plus light will inactivate herpes, vaccinia, louping ill, fowl plague, and canine-distemper viruses. The pathogenicity of these agents was not altered, however, if methylene blue was added to the viruses in the dark. These investigators also observed that it was necessary to free the virus from the host cell for methylene blue plus light to have its desired effect. The virus was not inactivated when small bits of chopped tissue were treated with the compound. The authors felt that the mechanism of inactivation of the virus by methylene blue was one of oxidation. They showed that free oxygen was necessary

for the viruses to be affected.

The action of methylene blue was tested on the viruses from cases 1 and 3. The following mixtures were set up for the experiment: 0.2 c.c. of a 1:100,000 dilution of methylene blue, and 0.4 c.c. of supernatant fluid of a 10-percent emulsion of infected mouse brain. One tube containing virus plus methylene blue and one tube with virus in "Z" solution were placed on white paper 30 cm. from a 75-watt light bulb. These tubes were exposed for 20 minutes. A third set of tubes with the viruses and methylene-blue mixture was kept in the dark for 20 minutes. The material in each of the three tubes was injected into sets of three mice each at the end of exposure. All mice which were injected with Simms's "Z" solution and the virus in methylene-blue solution which had been kept in the dark died within five to eight days. All animals inoculated with the solution of methylene blue plus virus which had been exposed to light lived. The same results occurred when the experiment was repeated.

It was thought that the mice injected with the methylene-blue inactivated viruses might have developed some immunity to the viruses. When these mice were inoculated 20 days later with their respective virus, however, they died within the same time as did the normal control mice.

Perdrau and Todd<sup>33</sup> found that infection of a scarified rabbit's cornea by herpes could be prevented if local treatment with a 1:200 dilution of methylene-blue solution was begun within four hours after the virus was instilled. The number of their experiments was small, and they had one infection when treatment was begun within four hours after the virus was instilled. They theorized that it took from four to eight hours for the virus to enter the cells and that the methylene blue in the presence of light inactivated the virus in the surface of the eye. It was, therefore,

CHART 3

SUMMARY OF CLINICAL FEATURES OF HERPETIC AND EPIDEMIC KERATOCONJUNCTIVITIS

Clinical Symptoms	Herpes Keratoconjunctivitis	Epidemic Keratoconjunctivitis
Nonpurulent conjunctivitis with edema of conjunctiva	+	+
Staining of epithelium over fully developed opacities	+	-
Superficial punctate opacities	+	+
Disciform corneal opacities	+	+
Loss of corneal sensation	Marked	Slight to none
Dendritic pattern in epithelium—late in disease	+	-
Iritis	+	+
Vesicles on lid margin	+	-
Bilateral infection	Very rare	Varies from epidemic to epidemic
Mild concurrent systemic infection	+	+
Epidemic spread	-	+
Immunity	Transient	Apparently greater than herpes simplex

thought that this compound might be of some value in clinical cases of epidemic keratoconjunctivitis before the development of corneal involvement. Any clinical evaluation of such therapy in a disease as variable as epidemic keratoconjunctivitis must be regarded with extreme skepticism. Methylene blue in a 0.05- to 0.1-percent solution in saline has been used in approximately 20 patients with suspected "E.K." and herpetic keratoconjunctivitis. It has been the general clinical impression that these patients have done better than those treated with sulfathiazole ointment, quinine-bisulfate ointment, and zinc sulfate. It is not suggested that methylene blue should be used in place of iodine therapy in the case of straight herpetic keratitis. In a limited number of cases,

however, it has seemed to have been of value in patients with herpetic conjunctivitis and epidemic keratoconjunctivitis before the onset and during the early stages of keratitis. The prolonged use of methylene blue every two hours will retard cell migration. Therefore, in a patient with epithelial defects in the cornea, it should not be used more than every two hours for a period of not over four to five days.

#### DISCUSSION

There is a marked similarity between the herpes virus and the "E.K." virus both in the clinical picture they produce and in their immunologic reactions. The clinical and laboratory points of similarity and dissimilarity are listed in tables 3 and 4. The numerous points of similarity strongly

CHART 4

SUMMARY OF LABORATORY FEATURES OF HERPETIC AND EPIDEMIC KERATOCONJUNCTIVITIS

Laboratory Procedures	Herpes	"E.K."
Negative cultures	+	+
Predominance of mononuclear cells in smears	+	+
Keratitis in rabbits	+	+
Intranuclear inclusion bodies	Easy to produce	Difficult to produce
Inactivation by methylene blue and light	+	+
Passes through an E.K. Seitz (double pad) filter	+	+
Cross neutralization	-	+
Reaction produced by intracerebral inoculation of herpes-immune animals	Survived	Succumbed

suggest that the two viruses are the same, but there are several facts that are difficult to reconcile with this assumption. From the clinical viewpoint, the following points against the identity of the two viruses may be mentioned: (1) the occurrence of epidemics caused by the "E.K." virus, (2) that in the thousands of cases of epidemic keratoconjunctivitis that have been reported since 1889 very few patients have been noticed to have dendritic lesions on the cornea during the course of their disease, (3) an unusually large number of cases of herpetic keratitis have not been noted simultaneously with the epidemics of epidemic keratoconjunctivitis. From the laboratory viewpoint the following incompatibilities may be noted: (1) animals completely immune to herpes are killed by intracerebral inoculation of the "E.K." virus; and (2) the "E.K." virus is of smaller size than the herpes virus, as was shown by filtration experiments. Despite these clinical and laboratory differences, it appears likely that the viruses, even with distinct differences, are closely related and are of the same genus.

At the present time, there is no known specific therapy for either the herpes or the "E.K." virus. Herpetic keratitis responds very well to removal of the cor-

neal epithelium either by iodine or trichloroacetic acid. It would seem, however, that this method of therapy would not be entirely adequate when the virus is also present in the conjunctiva. Convalescent-serum therapy has been suggested for epidemic keratoconjunctivitis during the first few days of the disease. The serum is not always easy to obtain, however, nor has the efficiency of the therapy been entirely proved. Methylene-blue therapy has not been thoroughly tried in herpetic or epidemic keratoconjunctivitis, but it has been thought to be of value in the treatment during the early stages of these diseases.

#### CONCLUSIONS

1. Herpes-simplex virus can cause a keratoconjunctivitis which is clinically almost identical to that caused by the "E.K." virus.
2. In spite of the similarity in the clinical picture and the cross immunologic reactions of the two viruses, they are thought to be separate entities but are probably of the same genus.
3. Intracellular inclusion bodies produced by the "E.K." virus have been demonstrated experimentally for the first time.
4. Methylene-blue therapy for herpes and epidemic keratoconjunctivitis appears to be of some value in the early stages of these diseases.

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# THROMBOSIS OF THE RETINAL, CHOROIDAL, AND OPTIC-NERVE VESSELS

## A PATHOLOGIC STUDY\*

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There are many gaps in our knowledge of occlusion of retinal vessels in spite of the excellent work of previous investigators. Of these the most outstanding are Harms, Coats, and Scheerer. Their painstaking anatomic work laid the foundations for others to build upon. They showed the relationship between thrombosis and embolism. The idea that a floating thrombus establishes itself at a locus minoris resistentiae of the vessel wall dominated the investigation of this problem for a long time, but it is not now accepted as a common event. It may happen in a small minority of the cases and sometimes in branch thrombosis with relatively good prognosis. But such cases rarely come to an anatomic examination. The eyes which one gets for histologic examinations are predominantly in consequence of death from a general vascular disease, or eyes removed as blind and painful owing to glaucoma which has supervened after thrombosis of the retinal blood vessels. Cerebral involvement and heart implications are often linked with occlusion of the retinal vessels (Foster Moore, 1924, and others) which should never be considered as an isolated disease.

As early as 1905, C. L. Harms had shown that the artery and the vein may be affected simultaneously. Arterial and

venous changes were found in all eight of our cases.

In the case of Mrs. J. (excision for secondary glaucoma following thrombosis of retinal vessels) the optic nerve, including the disc, was removed with a trephine, the diameter of which, for this purpose, must, of course, be slightly greater than the diameter of an optic disc. Serial horizontal sections were then made of the excised optic nerve. We believe that, by this method, one may get a better picture of the whole vascular tree, especially in the region of the cup, than by the simple cross sectioning of the excised optic nerve.

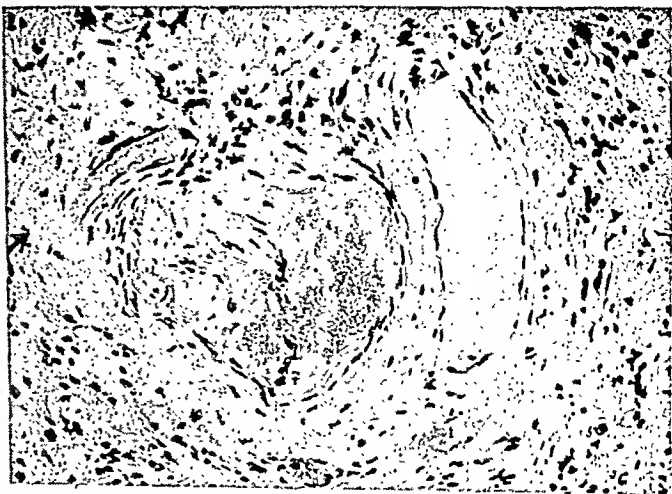
Figure 1 is a cross section of the nerve near the point where it was cut at the operation. The artery is closed by an organized mass dividing what remains of the lumen into separate channels. Alongside is the central vein, unchanged, but it was of great interest to find it thrombosed about 1 mm. nearer the eyeball. A nearby arterial anastomosis is recognizable by its inner elastic membrane. No re-canalization is present in the blocked lumen, as far as is observable in the series of sections. The two channels within the occluded artery have no endothelial lining.

We found many signs of disease of the arteries in our cases of thrombosis.

(1) The most impressive is subendothelial fatty necrosis, often an initial stage in the pipe-stem sheathing of arterial vessels (Ballantyne, Michaelson, and Heg-

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Fig. 1 (Loewenstein and Garrow). Cross section through optic nerve about 5 mm. behind the globe. Stained with hematoxylin and eosin, approximately  $\times 150$ . Note organized thrombus in the artery; normal vein with complete endothelium; an arterial anastomosis (arrow).



gie, 1938). A piece of the nerve, removed by a trephine, as described, was embedded in gelatine and the frozen section was stained with sudan III. The necrotic fatty masses have a shining red appearance (fig. 2) under the undamaged endothelium. This subendothelial fatty necrosis is fairly common in hypertensive retinopathy and advanced arteriosclerosis. We have found it in choroidal arteries also. Endarteritic thickening was described by Coats 30 years ago. An artery may be closed, or almost so, by this abnormal subendothelial growth alone. Coats assumed that it may be a secondary change in the thrombotic process; as we have observed this change in cases of hypertension without thrombosis, we think it primary.

(2) In the narrowed lumen of many of these arteries we have found a sprinkling of blood pigment on the collections of red blood corpuscles. We consider this to be not an artefact but a sign that the contents of such vessels had not participated in the blood circulation for some time. This *stasis* blood was found in the choked arteries in the retina, in the optic nerve, and in its sheaths. It has been assumed (Rucker) that intravital fibrinization of the blood, resulting from *stasis*, is a factor in the causation of thrombosis. Our impression is that the *stasis* in our cases is secondary and that it occurs in a lumen already narrowed by the subendothelial overgrowth.

(3) The blood disintegrates in the arteries and veins and especially in the

capillaries, leaving a deposit of blood pigment. Figure 3 is a photomicrograph of a piece of unstained retina in bulk and is a good example of the value of this method of examination. The vessels are clearly seen, having been stained with the deposited blood pigment. Such a rete mirabile is a true increase of vessels in contrast to what is seen in brain tissue, where the seeming increase is due to shrinkage of the cerebral substance. Coats (1913) has described miliary angiomas, small vascular loops at the inner retinal surface. Its occurrence has been con-

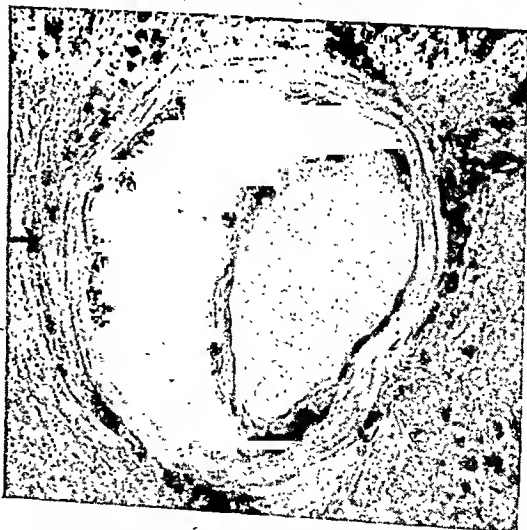


Fig. 2 (Loewenstein and Garrow). The arrow points to subendothelial fatty necrosis in the central artery of the retina. Stained with hematoxylin and sudan III.

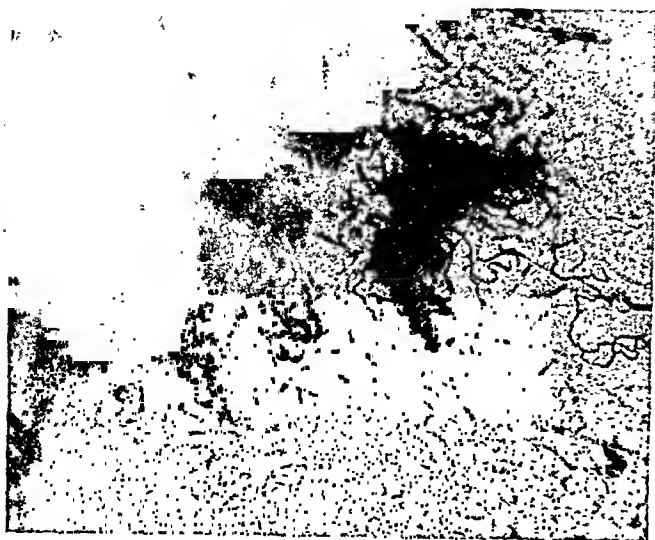


Fig. 3 (Loewenstein and Garrow). Unstained retina in bulk, from cases of thrombosis of central vein. Superficial retinal rete mirabile. The walls of the newly formed capillaries are black from blood staining.

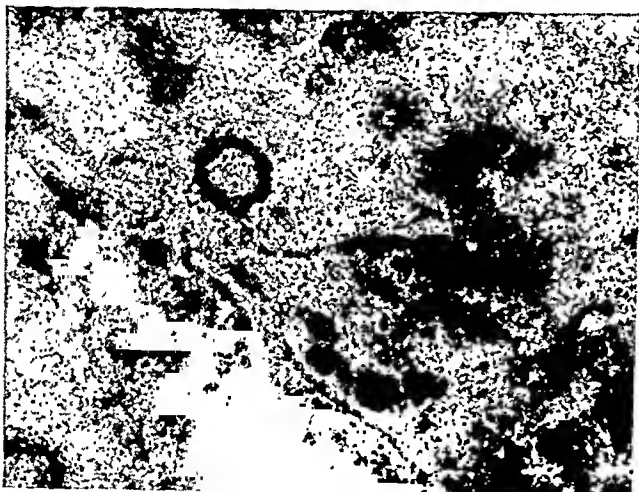


Fig. 4a (Loewenstein and Garrow). Thrombosis of central vein. Retina in bulk stained scarlet red. Note chains of aneurysms.



firmed by Leber (1915). Aneurysmal ectasias are frequently found in our slides and are most easily seen when the retina, stained with scarlet red, is examined in bulk (4a, b). The vessel walls where fatty appear bright red, and one sometimes sees the red fatty droplets within the wall and sometimes there is diffuse red staining of the wall. This latter appearance is most commonly seen at the ectatic parts. Fig. 4b shows a section of a chain of circular aneurysms, and in one of them the connection between the aneurysm and the capillary.

(4) We know, since Hertel published the results of his research (1900), that the elastic elements of the blood vessels increase with age. In our cases we find that the lamina elastica interna, stained with Weigert's elastic staining, is generally thickened, with local increase of this thickening in places. Sometimes the anastomotic vessels have an especially thick elastica. The increase of this layer seems to be not in thickness only but also in its transverse length, manifested by a bulging of the layer into the

Fig. 4b (Loewenstein and Garrow). Chain of circular aneurysms in retinal periphery in a case of thrombosis of central retinal vessels. Colloidin section; hematoxylin and eosin staining,  $\times 150$ .

Fig. 5a. (Loewenstein and Garrow). Cross section of normal optic nerve through central vessels. Note loose narrow layer of perivascular connective tissue and the narrow septa surrounding the nerve-fiber compartments. Contrast with figure 5b.



lumen. One may suppose that the increase in this transverse direction must cause some wrinkling of the inner surface of the vessel during life. If so it would be another factor favoring stasis of the circulation there.

(5) It was known to Coats that the connective tissue surrounding the central vessels is greatly thickened. We found it increased sometimes as much as five or six times the normal thickness. And the septal connective tissue also takes part in this thickening. This is very clearly shown by comparing figure 5a with figure 5b. The former is from a normal optic nerve, and one notes that the perivascular connective-tissue layer is narrow and of a very loose structure and that the septa surrounding the nerve-fiber compartments are very narrow. On the other hand, figure 5b is from an optic nerve in which the central vein was thrombosed. The section shows tremendous thickening of the perivascular connective tissue, and the septa are sclerosed and greatly thickened also. An organized thrombus is seen in the vein. In another case this increase of elastic fibers in the septa pro-

duced a dense crisscross pattern on section. Without doubt the structural peculiarity of the cribriform-plate region is partly responsible for the frequency of thrombotic processes there.

(6) In the course of our examination of slides given by Professor Brueckner (Basle) to Prof. A. J. Ballantyne (Glasgow), to both of whom we are indebted, we found an artery blocked, almost completely, by a thrombus resembling a

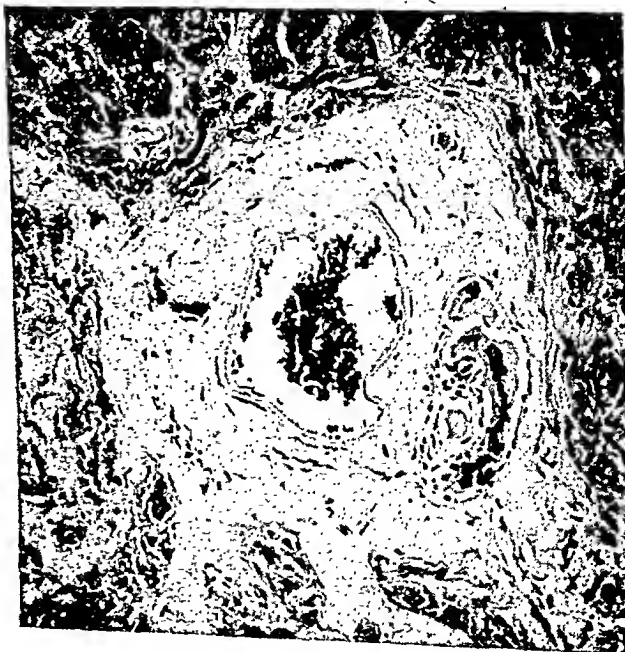


Fig. 5b (Loewenstein and Garrow). Cross section of optic nerve through central vessels from a case of thrombosis. Note organized thrombus in the vein; greatly thickened sheath of perivascular connective tissue; septa also greatly thickened; nerve-fiber compartments small and irregular.



Fig. 6 (Loewenstein and Garrow). Thrombosis of the central vein. Polypuslike thrombus in the artery just behind cribriform plate. Round-cell infiltration of the tissue between the artery and vein. Lymphocytic infiltration of the vein wall (oblique section).



Fig. 7 (Loewenstein and Garrow). Cross section through optic nerve. Note at "a" exudation outside the thickened internal elastic layer. Destruction of endothelium of central vein. Great increase of the elastic fibers surrounding the vessels. Weigert's stain,  $\times 150$ .

polypus (fig. 6). The polyp consisted of young connective tissue with a great mass of fibroblast nuclei, and it was situated just behind the lamina cribrosa. This organized thrombus had grown from the arterial wall on the side next to the vein. In the section these vessels have been cut somewhat obliquely. Such a polypuslike growth filling the arterial lumen was described by Scheerer (1925). He considered it due to an endothelial overgrowth. Our photomicrograph shows a lymphocytic infiltration between the artery and the vein invading the wall of the vein. We have found this in some of the other cases but less well marked.

(7) Figure 7 shows a considerable exudative mass just *external* to the inner elastic membrane. It has no recognizable structure and is not surrounded by any inflammatory process, and there are no thrombotic changes in that part of the artery, nor in the vein just alongside. The elastic staining of Weigert shows irregular thickening of the elastic lamina of the artery. This structureless exudation into the wall of an artery is not mentioned, as far as we can find, in the copious literature of sclerosis of cerebral or retinal vessels. It appears to be quite different from the usual subendothelial change, which is mostly granular and fatty. It is different, too, from the athero-sclerosis of Marchand, which is a necrotic process occurring *inside* the inner elastic membrane.

(8) Degenerative changes were found in parts of the elastic lamina of Bruch. One slide showed a gap

in it filled with exudative granulation tissue with pigmentary changes and degeneration of the contiguous neuro-epithelium. On another slide of an excised eye, we found that Bruch's membrane stained irregularly, and on another we found a layer of exudate dividing the pigment epithelium into two layers. We assume that the damaged Bruch's membrane fails in its filtering function. This permits the transit of unfiltered or insufficiently filtered nutritional fluid into the retina. These degenerative changes appear to be of the nature of a fatty infiltration. In addition to this fatty change found in the arcus lipoides of the marginal parts of the cornea, the sudan stain for fat shows it to be present in the sclera, the ciliary body, and in Bruch's membrane. Figure 8 is a photomicrograph from a case of hypertensive retinopathy with thrombosis of the retinal veins. The section shows a blood vessel with much subendothelial deposit of fat. Bruch's membrane has become almost entirely fatty. Between this highly fatty portion of Bruch's membrane and the retina there is considerable subretinal exudate, also infiltrated with fat. The presence of this exudate supports the opinion of one of us (A. L., 1941) that the glass membrane known as Bruch's plays an important part in the nutrition of the outer layers of the retina. The chemical product filtering through a fatty Bruch's membrane will be different from the normal nutritional fluid.

We have shown in figures 6 and 7, and have found in many other instances, that the arterial-wall diseases occur close to the similarly affected veins. Figure 6 shows a pathway of round-cell infiltration between the artery and the vein and lymphocytic infiltration of the venous wall (Coats). Figure 7 shows exudate in the wall of the artery external to the

thickened internal elastic layer, and in the serial sections thrombosis of the vein was found a short distance along the nerve toward the eyeball. These appearances suggest that the pathologic process creeps over from the artery to the vein. We had the opportunity of watching, by means of the ophthalmoscope, something of the



Fig. 8 (Loewenstein and Garrow). Retina from case of thrombosis of central vessels. Note subendothelial fat in a retinal artery (a) fatty subretinal exudate (b), and fatty Bruch's membrane (c). Sudan III staining,  $\times 300$ .

same nature in a case of thrombosis of the central vein. The lower branch of the central artery, for a distance of 1 D.D. from the disc, had a broad silvery sheath. In two weeks' time this sheath could be traced downward to a distance of about 2 D.D., where a vein crossed the artery. A week later we found, to our astonishment, that there was less of this arterial sheathing but that the vein had now a sheath of similar appearance peripheral to the crossing. A dense vitreous hemorrhage later on interfered with further ophthalmoscopic examination.

J. Friedenwald has stressed the fact that



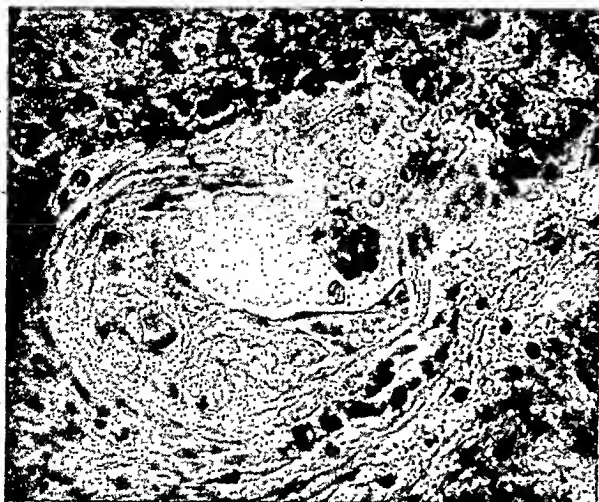


Fig. 9 (Loewenstein and Garrow). From a case of thrombosis of the central vessels. Rupture of an atheromatous vessel. Subendothelial overgrowth with degeneration probably fatty. Hematoxylin and eosin staining.

in arterial sclerosis an extension of the lesion in the diseased arterial wall could often be traced on to the vein at the point

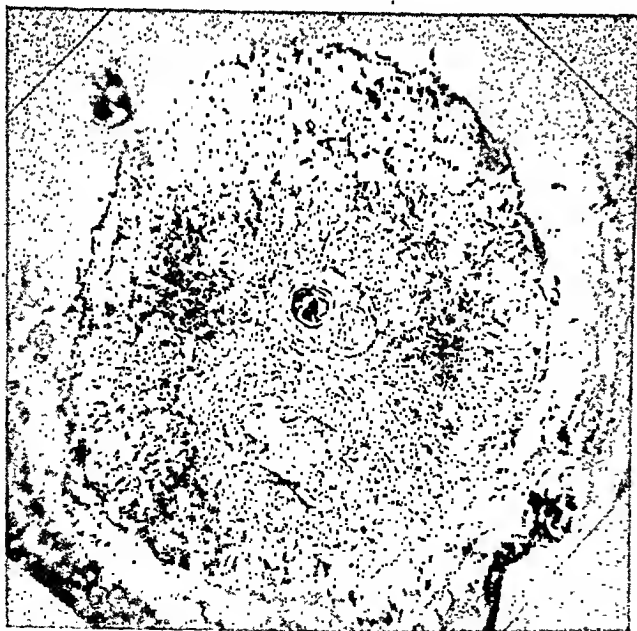


Fig. 10 (Loewenstein and Garrow). Thrombosis of central artery and vein. Cross section through optic nerve about 3 mm. behind the eyeball. Note broad sheath of connective tissue around and between central vessels. The elastic elements are much increased. Cavernous degeneration in lower left quadrant. Sclerotic patch below central vessels surrounded by long elastic fibers.

of crossing. Frequently there is no sharp demarcation between the arterial and the venous walls. It is often impossible in cross sections to distinguish what belongs to the arterial and what to the thrombosed venous wall. Koyanagi has referred to the frequent appearance of venous thrombosis at the crossing by arteries.

As many investigators have found, it is common to find in thrombosed peripheral veins strands of a tissue with many fibroblasts dividing the lumen into compartments, each lined with endothelial cells. Some of these endothelial cells are very large; and a high magnification ( $\times 1350$ ) reveals that they are groups of from three to six separate endothelial nuclei, but without separate plasma for each. It is as if, as in the case of giant cells, the nuclei have divided more quickly than it was possible for the plasma to divide. A similar appearance was observed in the endothelium of the arachnoidal sheath of the optic nerve, where such giant cells are found infrequently.

It is still undecided whether there is a primary thrombosis occluding the lumen or always a primary proliferation of the endothelium, as Verhoeff (1906) supposed. Our sections cannot throw light on this vexed question. In our cases the disease of the vessel walls had been of long standing and offered no opportunity of studying early changes. It is certain, however, that some of the small and medium-sized vessels show the endothelial lesions only without a thrombus. In these vessels, therefore, the endothelial change may be primary.

As one would expect, the vessels

in the retina participated in the changes found in the vessels of the optic nerve and its sheath. In our cases of retinal thrombosis phlebo-sclerosis is a common occurrence and it is therefore not restricted to the diabetic retinopathy (A. J. Ballantyne and A. Loewenstein, 1943).

Usually one cannot say with certainty, on clinical grounds, that a retinal hemorrhage has occurred by diapedesis or by rupture of a vessel wall, but we have sections that show the rupture in the wall of the vessel through which the blood has escaped. In one instance it had infiltrated into the substance of the retina in a case of arteriosclerotic thrombosis with secondary glaucoma. This is a piece of retina in bulk, where we luckily discovered the source of the intraretinal hemorrhage. Figure 9 is a photomicrograph of a section showing the rupture of the wall and the red blood corpuscles escaping through it in another case. Fatty changes have probably produced the *locus minoris resistentiae* which has resulted in the splitting and in the rupture of the vessel wall.

Figure 10 is a cross section of the optic nerve about 3 mm. behind the disc. One's attention is immediately arrested by the changes seen at three places; namely (a) the broad sheath of connective tissue surrounding the central vessels; (b) the sclerosed plaque below the central vessels and half-way between them and the margin of the nerve; (c) the fairly large patch of cavernous degeneration of the nerve at the margin at 7-o'clock position. (a) and (b) are well seen in figure 11, which is a photomicrograph taken with a high power lens.

The sclerosed plaque is about one sixth of a diameter of the optic nerve. It has an

irregular margin and is surrounded by a dense coat of elastic tissue. It is quite smooth and apparently structureless and there are no nuclei in the plaque.

In addition to the case from which figure 10 was taken two more of our cases showed cavernous degeneration. In

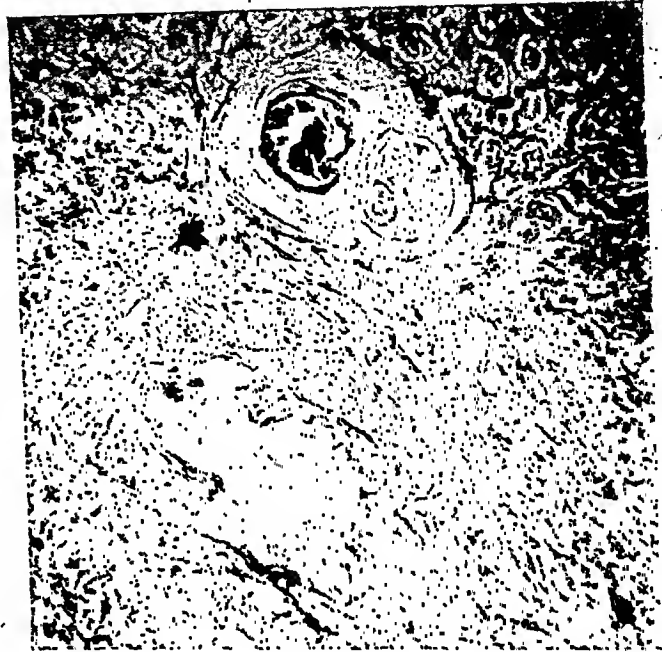


Fig. 11 (Loewenstein and Garrow). High power of figure 10, approximately  $\times 150$ . Note thrombotic changes in the vein; the elastic fibers around the sclerotic plaque; compartments of the nerve-fiber bundles less sharply defined to the left, where near the patch showing cavitation.

appearance it resembles Schnabel's cavernous changes found just behind the cribriform fascia in glaucomatous eyes. Figure 12 shows a patch of it in another case, and figure 13 in yet another. The latter, a longitudinal section, shows two patches of it—one small circumscribed patch near the base of the physiologic cup and the other, much larger, and less sharply defined, just behind the cribriform membrane and very near the central vessels. Softened nerve-fiber bundles in yet another case are found throughout the whole thickness of the optic nerve. (fig. 14).



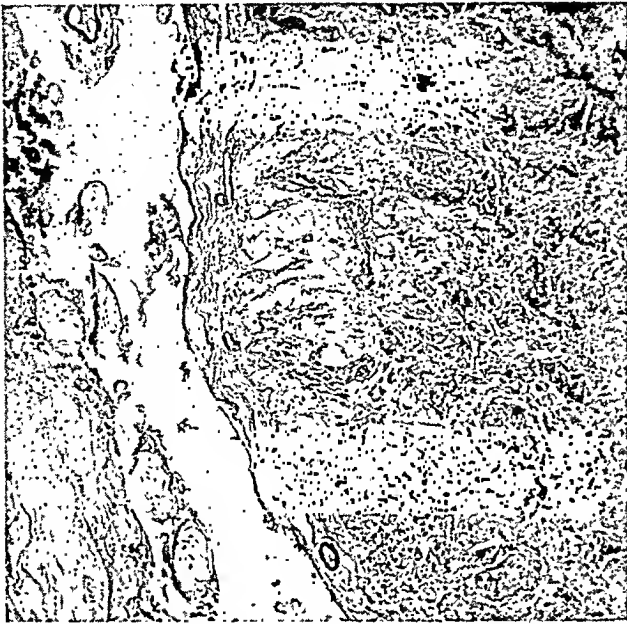


Fig. 12 (Loewenstein and Garrow). Cross section of the part of the optic nerve showing cavitation (see fig. 10), approximately  $\times 150$ .



Fig. 13 (Loewenstein and Garrow). Two patches of the cavernous degeneration of the optic nerve from a case of thrombosis of the central vessels. Upper arrow points to a small patch of it at the base of the physiological cup. Lower arrow points to a large patch of it near the thrombosed central vessels.

Scheerer (1923) described a case of aberrant nerve-fiber bundles of the optic nerve in a case of thrombosis of the central vessels. He reproduced a transverse section through the optic nerve behind the cribriform plate, showing a very similar patch of cavernous degeneration of the nerve fibers without mentioning it in the text.

We do not consider that glaucoma had taken any part in the production of these cavernous changes in our cases. Indeed, one slide showed a large patch behind the cribriform plate and a physiological cup. It may be that Schnabel's caverns are caused by similar vascular processes, as secondary venous changes are not rare in primary glaucoma (Salzmann, 1933).

The sclerosed plaque (figs. 10 and 11) and the cavernous patches have an interest extending beyond the local confines of the optic nerve. The plaque resembles those found in other parts of a diseased central nervous system in disseminated sclerosis. It is significant that we find this plaque and the patches of softening and cavitation in an optic nerve that is the seat of thrombosis of the central vessels. Questions, therefore, naturally arise as to the relationship. Are they due to vascular changes in their neighborhood? This has been a vexed question in the case of disseminated sclerosis. As far back as 1862 Rindfleisch assigned a primary role to vascular lesions. Ribbert (1882) confirmed this.

In more recent times much work has been done in the way of examination, by modern technique, of many cases of disseminated sclerosis. Putnam (1937) found a great many plaques associated with thrombosed veins in or near them, as did Marburg (1942). Both found little change in the endothelium of the vessel wall and suggested that the primary cause may be in the circulating blood.

Dow and Bergland (1942) examined 60 lesions from five cases, by serial section, and in only 9 was the lesion near a thrombosed vein.

Dawson (1916) found that small plaques extend along a vessel, always a vein, like a sleeve. In only a few instances did Dawson find aggregations of white cells and fibrin in the lumen but never any organization of them into definite thrombi, and never any alteration in the vessel wall, although he made many examinations in search of such changes.

Scheinker (1943) concentrated on the pathology of *acute* cases of disseminated sclerosis as likely to show the early changes. He found that two thirds of all the earlier lesions were around medium-sized veins and capillaries. These vessels were engorged and partly thrombosed. Perivascular cuffing was noticed and loss of myelin in scattered typical plaques. Complete absence of repair is an important feature, as is the spongy tissue within a softened area, with many small vacuoles and cysts.



Fig. 14 (Loewenstein and Garrow). Longitudinal section of optic nerve from case of thrombosis of the central vessels. Sponginess throughout the whole nerve, with many spaces between the nerve-fiber bundles. Hematoxylin and eosin staining, approximately  $\times 150$ .



Fig. 15 (Loewenstein and Garrow). Cross section of part of the optic nerve with its sheaths. Thickening of the pia. Subarachnoid hemorrhage. Hematoxylin and eosin staining, approximately  $\times 75$ .

Sheathing of retinal veins was recently found in disseminated sclerosis by Rucker (1944). Out of 34 cases of unexplained sheathing of retinal veins 21 were diagnosed as disseminated sclerosis and 7 were suspected of it. Thrombosis of small blood vessels may therefore be not without importance in the etiology of sclerosed plaques in the central nervous system and in the optic nerve.

One specimen afforded evidence that thrombosis of the smaller vessels in the septa of the optic nerve may be the cause of the cavernous changes. There was close proximity of the cavernous patch to the thrombosed small vessel.

Our specimens showed many changes in the sheaths and in the spaces surrounding the optic nerve.

Subdural and subarachnoid hemorrhage are common in the sheaths of the optic nerve in cases of thrombosis of the central vessels (fig. 15). One slide showed a hemorrhage in the substance of the dura. It and some of the other collections of blood were freely sprinkled with pigment, which is evidence that the bleeding was *ante mortem*. Blood within the sheaths of the optic nerve intruding during the excision of the eye is massed and looks entirely different.

The septa passing from the pia mater into the nerve have so few blood vessels that one has to examine many of them before finding a vessel. Thickening of the pial sheath itself is found, as shown in figure 15. Implication of the arachnoid is shown by the formation of adhesions to the pia on the one side and to the dura on the other. Threads are seen to pass from this band of adhesion. The thickening of the pia is not uniform. It is greater at some points than at others (fig. 15). In one of the cases the width of the thickened pial sheath measured 230 $\mu$  at some places. This tissue showed an abnormal increase

of fibroblast cells and in some places groups of giant cells.

Changes in the choroidal vessels are not common but they do occur in isolated vessels here and there. This could easily be missed in the usual examination of sections. The method of choice is the examination of the choroidal tissue in bulk, partially depigmented and stained for fat. Actual occlusion of a choroidal vessel was seen only twice. The condition seems to begin as a subendothelial fatty change in the arteries and in the veins, with reduction in the size of the lumen. Endothelial growth is common and predominant sometimes. In none of the cases was there any reason to assume an inflammatory etiology of the vascular changes that we have described.

#### SUMMARY

Eights cases form the basis of this paper and the thrombotic changes were found in the vessels of the retina, of the optic nerve, and of the choroid. Subendothelial fatty necrosis is frequent and may be found in the choroidal vessels as well. The veins and the arteries are usually involved in the changes.

A newly formed rete mirabile is stained sometimes by a dark bloodstain. Chains of aneurysms may show fatty walls.

The central vessels in the optic nerve are often surrounded by a broad sheath of hyaline connective tissue with numerous elastic elements in it. A thrombus resembling a polypus was found in one artery, with a lymphocytic infiltration of the wall of the nearby vein. In one artery a mass of exudate, which stained pink with eosin, was found external to a thickened internal elastic coat. The existence of a hemorrhage through a rupture in the wall of the vessel could be proved twice histologically. One organized venous thrombus showed endothelial giant cells.

Hemorrhage into the subdural and the

subarachnoid spaces around the nerve is common. Some of these are freely sprinkled with blood pigment.

Bruch's membrane may be damaged by a fatty infiltration, and in some places interrupted. Opposite one of these gaps there was damage of the external layers of the retina and a subretinal exudate. It is suggested that this is due to defective filtration through the damaged Bruch's membrane.

In three of the cases spongy degeneration and cavitation of the optic nerve were found.

A sclerosed plaque was found in one optic nerve with thrombosed small vessels near its margin and the thrombosis of these small vessels is probably the cause of the sclerosed plaque. The plaque may be similar to those found in disseminated sclerosis.

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## THE TREATMENT OF NONSPECIFIC UVEITIS WITH PENICILLIN

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JACOB SCHULTZ, LT. COL. (MC), PHILLIPS THYGESON, LT. COL.  
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Inflammations of the uveal tract (iris, ciliary body, and choroid) are a common cause of disability in both military and civilian personnel. In the Army Air Forces they constitute the most common eye lesion requiring hospitalization (excluding battle injuries), and the number of man-hours lost per case far exceeds that lost from other common eye diseases. Unlike most of the latter, they respond poorly to treatment and are particularly subject to recurrences.

Uveitis is not a disease *sui generis* but is a symptom complex arising from a number of causes of which the more important are considered to be syphilis, tuberculosis, gonorrhea, brucellosis, sarcoidosis, focal infection, and probably lymphogranuloma venereum. Certain cases of recurrent serous iritis are associated with rheumatoid arthritis and usually show a sensitivity to certain streptococcus antigens.<sup>1</sup> Etiologic diagnosis is a difficult matter and can in general be made only presumptively, owing to the lack of a characteristic clinical picture for each etiology and to the endogenous nature of the disease which precludes direct bacteriologic or immunologic study. A large proportion of cases in this country are nonspecific and are believed to be related to focal infection. Nonhemolytic and viridans streptococci are the organisms most commonly incriminated, and teeth and tonsils are the foci believed to be most often concerned.

While chemotherapy with the sulfonamide drugs<sup>2</sup> has in general been disappointing in uveitis, a small number of apparently sulfonamide-susceptible cases<sup>3</sup> have been reported, and this has raised

the hope that penicillin might prove more successful. At the suggestion of Dr. Conrad Berens, Civilian Consultant to the Secretary of War, a cooperative program to test the effect of this drug in non-syphilitic cases was undertaken at five Army Air Force hospitals. The program was outlined and coordinated by Lt. Col. Michael J. O'Connor (M.C.), Executive, Professional Division, Office of the Air Surgeon. The following five chiefs of ophthalmologic sections and their assistants have participated in the study: Lt. Col. Arthur Unsworth, AAF Regional Station Hospital No. 1, Coral Gables, Florida; Lt. Col. Phillips Thygeson, AAF Regional Station Hospital, Drew Field, Tampa, Florida; Major Frank Maury, AAF Regional Station Hospital, Santa Ana, California; Major Jacob Schultz, AAF Regional Station Hospital, Randolph Field, Texas; and Major S. Rodman Irvine, AAF Regional Station Hospital, Hammer Field, California. The collected data have been reviewed and analyzed by Lt. Col. Phillips Thygeson.

### TYPES OF UVEITIS AVAILABLE FOR STUDY

A total of 56 cases of anterior and posterior uveitis were treated with penicillin. Of these, 16 were cases of acute iridocyclitis, 14 of chronic iridocyclitis, 11 of acute choroiditis, 14 of chronic choroiditis, and 1 was of chronic uveitis in which both anterior and posterior segments were involved. Etiologic studies were inconclusive, but with three possible exceptions all cases were nonspecific in character. The three exceptions were cases in which a positive serology for syphilis was found; none of the specific clinical changes of

syphilis were demonstrable, however, and in two cases previous antisyphilitic therapy had not noticeably influenced the disease. The Mantoux intradermal tuberculin test was positive in 9 of 26 cases in which it was recorded, but none of the anterior-segment inflammations showed nodular changes on the iris or other suggestive clinical lesions of tuberculosis.

#### METHOD OF TREATMENT

As may be seen in table 1, dosages varied widely in this series from a minimum of 100,000 units to a maximum of 2,100,000 units, the average being about 450,000 units. Duration of treatment also varied widely from a minimum of 1 day to a maximum of 10 days, the average being about 6 days. The penicillin was administered intramuscularly (usually 4 times daily) in all 56 cases. In five of the cases each intramuscular injection was followed 15 minutes later by paracentesis of the cornea in an effort to increase the

TABLE 1  
PENICILLIN DOSAGE IN 56 CASES OF UVEITIS

Units	No. of Cases
100,000	4
140,000	4
200,000	7
300,000	1
350,000	2
400,000	4
440,000	4
500,000	2
600,000	6
640,000	1
750,000	7
925,000	1
960,000	1
1,000,000	5
1,400,000	4
1,530,000	1
1,590,000	1
2,100,000	1
	56

penetration of penicillin into the aqueous. Atropine sulfate was used routinely to dilate the pupil in the anterior-segment cases.

#### RESULTS OF THERAPY

Table 2 shows the results obtained in the treatment of the 56 cases. It will be seen that only in acute iridocyclitis was any considerable improvement obtained

TABLE 2  
TREATMENT OF UVEITIS WITH PENICILLIN

	Significant Improvement	Slight Improvement	Unimproved
Acute iridocyclitis	9	3	4
Chronic iridocyclitis	1	1	12
Acute choroiditis	1	0	10
Chronic choroiditis	0	1	13
Chronic iridocyclitis and choroiditis	0	0	1

during or immediately after penicillin therapy; of the 16 cases of this condition, marked improvement was obtained in 9, slight improvement in 3, and no improvement in 4. These results were very different from those obtained in chronic choroiditis, none of the 14 cases of which showed marked improvement and only one slight improvement. Of the 11 cases of acute choroiditis there was improvement in only one. The results in chronic iridocyclitis were not much better, with improvement in only 2 of the 14 cases. No case in the series yielded a result comparable to the rapid clinical cure obtained characteristically with penicillin in gonorrheal urethritis. There was no correlation between length of treatment, dosage, and clinical results.

No control series of cases either untreated or treated by routine measures was run in connection with this study, but an analysis of 26 uveitis cases treated at Drew Field since January 1, 1943, is of interest. The results obtained on simple therapy, consisting of hot compresses, atropine sulfate, and foreign protein, roughly parallel the results in the penicillin-treated cases; that is, satisfactory.

clinical improvement in acute iridocyclitis but little or none in choroiditis. Furthermore, many of the uveitis cases in the penicillin series were recurrences which presented an opportunity to compare the course of the penicillin-treated attacks with the earlier nonpenicillin-treated attacks. No significant differences were noted.

#### PENICILLIN BY IONTOPHORESIS

In an effort to increase the concentration of penicillin in the anterior segment and aqueous, 8 cases of anterior uveitis not included in the series of 56 cases reported above were treated by iontophoresis according to the method outlined by Von Sallmann.<sup>4</sup> A special plastic chamber containing a platinum electrode was placed over the anesthetized cornea and the chamber filled penicillin-sodium solution (usually in a concentration of 300 Oxford units per cubic centimeter). The negative lead was then attached to the active electrode and the positive lead to the positive electrode at the patient's neck. A current of 1.5 to 2.0 milliamperes was used for treatment times of from 3 to 5 minutes. The treatments were repeated twice daily. Of the 8 cases of acute and chronic iridocyclitis so treated, 1 was treated for 3 days, 2 for 5 days, and 5 for 7 days. The passage of penicillin into the aqueous was demonstrated by assay of aqueous obtained by anterior-chamber puncture in two cases (Major S. R. Irvine).

No dramatic or clear-cut improvement which could be ascribed to the treatment was obtained in any of the eight patients treated by this method.

#### DISCUSSION

From the results here described it is clear that penicillin was ineffective in the treatment of this series of cases of chronic uveitis. It is doubtful even that penicillin

was the effective factor in the apparent successes with acute iridocyclitis, since this disease frequently runs a benign course on simple therapy, or even in the absence of therapy. In view of the high percentage of failures with sulfonamide therapy which have been reported, failure with penicillin should not be considered surprising.

Since this article was accepted for publication, Scobee<sup>5</sup> reported that in 75 per cent of cases of nonspecific uveitis penicillin seemed to have a marked therapeutic effect, but in no case was cure effected with penicillin alone. A dosage of 150,000 units per day for treatment times varying from 5 to 12 days was used. If no therapy other than penicillin was instituted, relapses almost invariably occurred in from 5 to 7 days. The claim of a marked therapeutic effect would seem to be open to grave question in view of the failure to obtain a single cure.

Although the results of this study must be considered negative, the findings have a certain importance as indicating the absence of penicillin-sensitive bacteria in uveitis. This constitutes additional evidence to support the belief that penicillin-sensitive or sulfonamide-sensitive bacteria are not present in the uveal tissues, since there is no reason to suppose that rapid clinical cure would not be obtained in most cases of nonspecific uveitis if such were the case.

It is unfortunate that no cases of gonococcal uveitis were included in this series. On theoretical grounds at least, a satisfactory response might be expected with penicillin in this condition, since direct metastasis of the organisms to the uveal tract very probably occurs. Goldberg<sup>6</sup> has described a case of probable gonorrheal choroiditis which responded favorably to penicillin. It is also likely that syphilitic uveitis will respond to penicillin therapy in view of the favorable effect of the drug

on other syphilitic manifestations. It is of interest that two cases of syphilitic uveitis have been reported<sup>7</sup> as improving strikingly on penicillin though one relapsed later. More recently Klauder and Dublin<sup>8</sup> reported three cases of syphilitic iritis, two of which were treated with 2,400,000 units of penicillin and one with 1,200,00 units. All three became quiescent within 12 days. From two to four weeks were usually required when arsenical therapy or combined fever and arsenical therapy were used.

### CONCLUSIONS

1. Fifty-six cases of anterior and pos-

terior nonspecific uveitis were treated with penicillin by intramuscular injection. Eight additional cases of anterior uveitis were treated by penicillin iontophoresis.

2. Only in acute anterior uveitis (iridocyclitis) was significant improvement noted during or after the period of treatment. This improvement appeared to be no greater than would be expected with ordinary forms of treatment, such as atropine, heat, and foreign-protein.

3. These findings suggest that penicillin-sensitive bacteria are not ordinarily concerned in the etiology of nonspecific uveitis.

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# STATUS OF COMPENSATION FOR OCULAR INJURIES IN THE UNITED STATES\*

## SOME FUNDAMENTAL CONSIDERATIONS

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In preparation for its Revised Report on Compensation for Eye Injuries,<sup>1</sup> the Committee on Visual Economics of the American Medical Association published in 1940 a tabulation of the compensation statutes and laws of all states in the Union with reference to compensation for eye injuries.<sup>2</sup> In the same year a tabulation of the monetary aspects of Workmen's Compensation Laws in the United States, including data relative to compensation for eye injuries, was also published by the U. S. Department of Labor.<sup>3</sup> The two tabulations are complementary of each other. The Committee's tabulation is somewhat incomplete; the writer knows of one error that it contains, and there are probably several others. The State of New York is stated to use only the factor of central visual acuity at 20 feet as basis for compensation. In reality it also compensates for loss of extraocular-muscle function and of visual fields when the occasion exists. Massachusetts is stated to compensate for the loss of an eye with \$500, whereas the U. S. Department of Labor's tabulation states that in the case of Massachusetts the amount of compensation "cannot be determined from the law."

What immediately strikes one in studying these two tabulations is the wide diversity of standards of compensation for an industrially damaged eye, in the 47 states that have compensation laws (Mississippi, as yet, has no law in operation). The Federal Government alone operates with two standards. The U. S. Employees' Compensation Commission, for the benefit

of injured civilian employees and long-shoremen, has one standard. Another standard is applied by the War Veterans Administration to injured members of the Armed Forces. The range is so great that for the loss of an eye an injured worker may be awarded as much as five times the amount of money in some states (Wisconsin and Connecticut) that he would receive in others (Washington and Oregon). Between these extremes may be found as many as 27 different values assigned to the same damage, from the ophthalmologist's standpoint, as a combined result of the operation of the several items in the varying laws.

This chaotic situation bids fair to become a more serious problem now than in the past. The postwar period will find large masses of our industrial population temporarily and permanently displaced and the disparities in our compensation laws more glaring. There is likely to be a much larger volume of compensation for eye injuries to be handled, including the additional complication of compensation for eye injuries incurred in Government-run war industries and in the war itself. The rehabilitation and reemployment of the war injured will be seriously affected under widely varying state laws and practices; consequently varying standards of visual requirement will be set up by industry. A worker might be industrially blind under the law in one state but not in another. A reconsideration of the problem and an attempt at some standardization is, therefore, necessary.

The solution of some aspects of this problem clearly falls within the domain

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of the social economist, the jurist, and the legislator. Compensation for ocular injuries shares these aspects with compensation for other injuries. These aspects are: standardization of benefits for permanent total disability; of those for temporary disability; of the percentage of weekly wages to be paid out in compensation; of provision for deductions from permanent awards for benefits paid out for temporary disability intended as incentives to the worker for return to industry; and standardization of compensation for facial disfigurement.

Other aspects are of such a purely medical nature that their solution devolves entirely on the physician and, in our case, on the ophthalmologist. The standardization of the principal items in compensation for eye injuries obviously cannot be dealt with by the others and the responsibility for it has to rest on the shoulders of the ophthalmologist. There are six such items.

- A. The amount that should be awarded for the loss of an eye, or loss of its use, in terms of a percentage of the award for permanent total disability.
- B. The definition of loss of use of one eye (monocular blindness), and of loss of use of the two eyes (binocular blindness, or permanent total disability).
- C. The definition of normal central visual acuity for distance and the degree of departure from the normal, subject to compensation.
- D. The method of dealing with partial loss of central visual acuity for distance.
- E. The method of dealing with the principal collateral, or auxiliary, functions of vision: those of the extraocular muscles, of peripheral vision and of accommodation.
- F. The maximum deduction for tem-

porary disability, if any, from the award for permanent damage to an eye.

In view of the authority of the A.M.A. Committee, the thought and labors it has devoted to the subject for over two decades, the fact that the Committee's report has found favor in more states, although their number is small, than has any other suggested method, the Committee's report is taken as the only basis for discussion. The 1941 Revised Report of the Committee states that "it eliminated one recommendation of the 1926 Report, supplied a few omissions, corrected some errors and clarified some steps." In the belief that the incorporation of a few minor recommendations and changes in the Committee's report would make it more widely acceptable and thereby further the badly needed standardization of compensation for ocular injuries in the United States, a revision of its report is suggested.

The present situation in regard to each item may be summarized as follows:

With reference to Item A, an analysis of the tabulations shows that compensation for the loss of an eyeball exceeds that for loss of use by a small amount in only 21 percent of the states; that compensation for loss of use of one eye in relation to that for permanent total disability varies between 10 and 50 percent; that in one third of the states compensation for permanent total disability is for life, actuarially the equivalent of 1,000 weeks, whereas in the rest it varies between 260 and 550 weeks, and that there is no parallelism between the maximum of compensation for permanent total disability and that for the loss of an eye. The majority of states favor 500 weeks as compensation for permanent total disability, or approximately in money \$10,000, and for the loss of an eye 100 weeks, or approxi-

mately in money \$2,000. The actual amounts in money vary somewhat because of varying weekly benefit limits which run from 50 to 70 percent of wages, and varying maxima running from \$12.50 to \$25.00. The tendency, therefore, may be said to favor a 20-percent relation in compensation for the loss of an eye to that for permanent total disability.

With reference to item B, no obvious tendency is demonstrable. Of the 47 states, only 14 define industrial blindness as a visual acuity of 20/200. In the remaining states the definition of industrial blindness varies all the way from a visual acuity of 20/100 to light perception. Of the 14 states defining it as 20/200, only 6 seem to demand that it be corrected visual acuity.

Item C furnishes the only instance of unanimity. All regard 20/20 as normal visual acuity, and two thirds begin compensation when visual acuity is reduced to 20/25; the rest only when it is reduced to 20/30.

Item D again exhibits a wide diversity of methods. About one half of the states have no mandatory method of appraisal of partial or percentage loss of use of an eye. The other half operates with eight considerably varying procedures. The method of the A.M.A. Committee is said to be in operation in 12 states but, unmodified, is actually in use in 6 states only.

In regard to item E, the formula recommended by the A.M.A. Committee is in use in 7 states; 15 other states presumably deal with the collateral functions separately. No data are available as to the remaining states.

No data are available as to the limits of deduction for temporary disability in case of eye injuries in the nine states that decree limits. In New York it is 20 weeks.

This summary of practices indicates sufficiently the great need of an attempt

at some standardization. What follows are suggestions in regard to each item for the purpose of discussion.

#### ITEM A. THE PERCENTAGE OF PERMANENT TOTAL DISABILITY WHICH LOSS OF AN EYE REPRESENTS.

Ever since 1881, when Switzerland initiated the movement for Workmen's Compensation Laws,<sup>4</sup> the problem of the proper relation that compensation for the loss of an eye should bear to that for permanent total disability has preoccupied ophthalmologists, jurists, legislators, representatives of capital, and representatives of labor. This relation constitutes the foundation on which the whole structure of compensation for ocular injuries must rest. During the first half of this period proposals varied between 50 and 10 percent. The maximum proposal of 50 percent was the result of the crude notion that if bilateral blindness constitutes a permanent total disability, monocular blindness is 50 percent of that. This notion was quickly discarded as untenable. The minimum of 10 percent was based on the purely economic approach, that is, the loss of earning statistically determined. This minimum was also found generally unacceptable mainly because of the lack of identity between the more-or less "constant" working capacity of a human being and the widely "variable" earning capacity of an industrial worker in a competitive labor market that is subject to periodic booms and depression, on the one hand, and a continual struggle between organized labor and organized capital on the other. A recent experimental attempt to determine the loss of productivity resulting from the loss of an eye, by the procedure of bandaging one eye of printers and noting the effect, was made in the U.S.S.R. and was found to result in a loss of 16 percent of productivity. This may be regarded as the real

minimum to be considered. Consideration has to be given to the fact that we are dealing with depression of a vital function of a human being and with the risk of his losing the other eye, and not merely with depreciation of a working machine. The result of all these considerations has been a stabilization of the practice and recognition that a loss of 25 percent of permanent total disability is the most reasonable compensation for the loss of an eye. A 1932 questionnaire among Swiss ophthalmologists,<sup>5</sup> who operate under a law providing for a maximum of 33 percent for skilled workers and a minimum of 20 percent for unskilled laborers, disclosed that in most cases awards for a 25-percent loss are made. It is evident that the majority of our states grant less than the minimum; that many states operate with a minimum, and that only a few recognize the average and higher standards of compensation for the loss of an eye. A standard of 25 percent of permanent total disability is indirectly indicated by the A.M.A.C. in its method of dealing with compensation for the rare injuries involving both eyes, by assigning a weight of three to the better eye.

That item A is the cornerstone of any method of compensation for ocular injuries is readily demonstrated by the following two illustrations:

In the case of an industrial commission operating on a 10-percent basis for the loss of an eye, the commission is presented by the A.M.A. report with a glaringly double standard in compensating for an equal damage to both eyes by 10 times the amount it grants for damage to one eye. Even in the case of the majority of states which observe a basis of 20 percent, binocular damage becomes five times that of monocular damage, instead of four times as recommended by the A.M.A. Committee.

Again, the majority of states favor

100 weeks' compensation for loss of an eye, and many deduct from permanent award that for temporary disability. Now, the average of the latter in ocular injuries has been found by the writer in New York State to be four weeks, and is not proportionate, of course, to the severity of the injury. For a permanent reduction of visual acuity to 20/25, for which 4.3 weeks are granted in accordance with A.M.A.C. method, practically nothing for his permanent damage would be given such an average individual.

It would, therefore, seem desirable for the A.M.A.C. to make a more definite recommendation as to item A of 25 percent, at which it has already arrived, as the most reasonable compensation for loss of use of one eye.

#### ITEM B. WHAT IS AN ACCEPTABLE CRITERION OF INDUSTRIAL BLINDNESS?

The A.M.A. Committee on Visual Economics does not define industrial blindness, except indirectly, by stating that "the reduction in visual acuity to 20/200 (6/60 when the metric system is used) or a reduction in visual efficiency to 20 percent or less, is the accepted standard of industrial blindness." This definition differs from that of the A.M.A. Committee on Definition of Blindness,<sup>6</sup> which states that "in general, visual acuity of *less than* one-tenth has been classed as economic blindness . . . such vision in the better eye when corrected with the best possible glass would be recorded as *less than* 0.1 or 6/60 or 20/200." Presumably the Committee on Visual Economics was motivated in its definition by the desire to accommodate itself to some legislative provisions that the loss of 80 percent of the vision of the eye is the same as the loss of an eye which, according to its table, is represented by 20/200 visual acuity. Both definitions are based on the notion of visual acuity as the sole

criterion of blindness, and neither attempts separate criteria for binocular blindness and for monocular blindness.

While visual acuity is the backbone of eyesight it cannot be employed as the criterion for both monocular and binocular blindness, whether economic, vocational, or educational. It is obvious that while a person with 20/100 or even 20/70 in either eye is handicapped for many occupations requiring good vision for distance, he is practically not handicapped at all if the lowered acuity is present only in one eye and the other is normal or much better. The reduction of visual acuity in one eye must be much greater than that to handicap him, and then not because of loss of vision for distance but solely because of his loss of binocular stereoscopic acuity, which is required in many occupations. Loss of the alternate use of either eye, such as is occasionally required in working in confined spaces which prevent turning of the head (inside boilers and tunnels and under motor cars), is a definite handicap. While, therefore, visual acuity may serve as the criterion for binocular defective vision, the only tenable scientific definition of monocular blindness would be in terms of the participation of an eye in the binocular act of vision; in other words, in terms of loss of binocular stereoscopic acuity. We have only recently learned to measure stereoscopic acuity with any precision. In the past the effect of reduction of visual acuity in one eye, the other being better or normal, could only be guessed at. A visual acuity of 20/70 was the first guess, then of 20/100, and later 20/200 came to be regarded as abolishing binocular stereoscopic acuity. Today, with our better means of measuring stereoscopic acuity, it is well known that a visual acuity of 20/200 in one eye, the other being normal, is compatible with fair binocular stereoscopic acuity, and that the

limit of binocular stereoscopic acuity is reached only when the visual acuity of one eye is reduced to less than 20/400. The latter may be regarded as the equivalent of the loss of use of one eye. Visual acuity, however, as an index of stereoscopic acuity loses its validity in the presence of strabismus and ophthalmoplegia, and is modified by the visual acuity of the other eye. Until further standardization of the measurement of stereoscopic acuity is accomplished it may be premature to abandon visual acuity as the index of damage to one eye, but the substitution of "*less than 20/200 v.a.*" as an index of loss of the use of one eye for "*20/200 v.a.*" is indicated. In favor of it is, as pointed out, the definition of the A.M.A.C. on Definition of Blindness, and the fact that all the other four recently proposed tables of compensation for eye injuries, in Italy, Russia, France, and the Argentine, tabulated and charted in table 1 and chart 1 (with New York State table and the older A.M.A.C. table added for purpose of comparison), so define it. The tabulation and charting, for the sake of a more rapid orientation, has been made directly in terms of loss instead of in terms of retained vision, making unnecessary a further operation of subtracting retained vision from 100 percent.

There are, in addition to the scientific objections to identifying monocular blindness with a too-high visual acuity, other objections of a sociologic nature. It lumps into one group persons with quite widely varying handicaps, and thus inequitably gives to some persons monetary compensation which could be more properly distributed among the more deserving ones; that is, to those who have lost an eye altogether or have definitely lost use of it in terms of loss of binocular stereoscopic vision. It also becomes a source of inequity when awards for the loss of an eye are made, in accordance with law or court decisions, regard-

less of an already existing high degree of subnormal vision before an industrial injury. It furthermore sets a false standard for industry in the selection of its personnel, and may prove a serious obstacle in the postwar rehabilitation program.

It is therefore proposed that monocular blindness be defined as less than 20/200 visual acuity, or, to be more precise, as 20/240, the next practical step in measuring visual acuity on the basis of a tolerance of 20 percent in our measurements of the higher thresholds.

For the compensation of binocular visual-acuity losses, the A.M.A.C. method of weighting the same or better visual acuity of the other eye with three is still applicable.

#### ITEM C. WHAT IS NORMAL VISUAL ACUITY AND WHAT SHOULD BE THE MINIMUM DAMAGE TO IT SUBJECT TO COMPENSATION?

Normal visual acuity is commonly identified with that of one-minute angle, or 20/20.\* It is loosely spoken of as perfect visual acuity. The A.M.A.C. Report of 1941 still says: "Therefore a 20/20 (6/6 metric) Snellen is employed as the maximum visual acuity of central vision or 100%."

The current standard of normal visual acuity of 20/20, corresponding to a minimum separable of one minute of arc and expressed by its trigonometric tangent of 1.6 mm. at 6 meters, or 20 feet, was proposed in 1862 simultaneously by Snellen and Giraud Teulon, but is commonly known as the Snellen standard. The basis of the standard minimum separable, as is well known, is the average size of a retinal cone and the position of the nodal point of the human eye. To regard 20/20

Snellen as normal, in the sense of the average of normal eyes, or of the most frequently occurring, or as perfect, or maximum visual acuity, is no longer warranted, and this standard has been challenged for some time.

Javal, as early as 1900, objected to the arbitrary manner by which Snellen established this standard. He is quoted by Lemoine and Valois<sup>7</sup> as follows: "Before publishing their test-type, our Utrecht colleagues tested the acuities of a considerable number of persons of varying ages free from any perceptible defects in their eyes. They computed the average of their observations and gave it the name of normal visual acuity. At that time they did not know how to correct many errors of refraction which to-day are known and corrected by those who know their ophthalmometry and skiascopy." To this may be added that at that time an astigmatism of 1 D. was regarded as negligible and that skiascopy was not invented until 1873, by Cuignet. Lemoine and Valois further say: "In reality Snellen normal visual acuity is often surpassed; some persons have 12/10 to 15/10, some even 20/10. . . . Generally this superior acuity is not systematically measured. As a general rule our test-type is made for the measurement of pathological acuities and does not contain lines for testing superior acuities."

Elschnig,<sup>8</sup> in his "Report on standardization of visual acuity to the International Congress of Ophthalmology," held in 1929, states that the minimum separable for the normal human eye subtends a visual angle of 43 seconds of arc instead of one minute. In our foot measure normal visual acuity would be 20/14.33, instead of 20/20.

Duke-Elder<sup>9</sup> says: "Normal visual acuity is between 1.5 and 2, although as high a value as 5 has been met with." That is to say, normal is between 20/13.3

\* [Comment: The denominator of the fraction 20/20 indicates a letter made up of a square of 5 by 5 one-minute-angle-subtending blocks. The entire letter subtends 5 minutes. Error]

and 20/10, and as high as 20/4 may be found.

These quotations serve to dispose of the assumption that 20/20 is the normal, let alone the maximum, visual acuity. The fact that we habitually measure thresholds of the minimum separable of 20/22, 20/25, and 20/30, which would appear incompatible with the basis of an unstimulated cone of one-minute angle lying between two stimulated cones, as the anatomic substratum of our normal, alone suggests that our standard is too low.

There are, however, few data in the literature establishing the incidence of acuities superior to one-minute angle in the population. The few recent reports are therefore worth noting.

Campos,<sup>10</sup> in an examination of 10,000 eyes, reports 76.28 percent with visual acuities of 20/15 or better; considers the possibility that the Brazilians as a people have a higher incidence of superior visual acuity, but concludes that more probably our concept as to what constitutes normal visual acuity is subject to revision.

Kuhn<sup>11</sup> found among 6,674 male workers a frequency of as high as 67.7 with visual acuities of 20/15 and 20/10, and says: "It may challenge some empirical concepts of norms, or it may scientifically substantiate them; for example, incidence of 20/15 as indicating a norm in the better of the two eyes rather than 20/20. However, I am not certain of this."

The present writer (table 2), as a by-product of another inquiry referred to later, found, in a small sample of 438 uninjured eyes of claimants for compensation, 38 percent with visual acuities better than 20/20, as compared with 36 percent possessing a visual acuity of 20/20 only. Even the injured eyes of the same claimants showed an incidence of 23 percent of visual acuity superior to 20/20 as compared with that of only 42 percent

possessing a visual acuity of 20/20 only. Since no attempt was made at correction to better than 20/20, the figures for superior visual acuity in both groups are, of course, much lower than is actually the case.

From the foregoing it is clear that a visual acuity of 20/20 is subnormal. Hence, it is logical to begin compensating for the consequences of an industrial injury when the reduction from 20/20 is slight, not when it is reduced to 20/25, the limit set by the A.M.A.C. table. It is therefore proposed that a visual acuity of 20/22 should be regarded as subject to compensation.

#### ITEM D. HOW TO DEAL WITH PARTIAL LOSS OF CORRECTED VISUAL ACUITY FOR DISTANCE IN ONE EYE

The answer to this problem is facilitated by a previous agreement upon the percentage of permanent total disability that should be awarded for the loss of the use of an eye, and upon the definition of monocular blindness. In addition, there is required a brief analysis of a universally used notation to express visual acuity, generally described as the Snellen notation.

This notation has grown out of the concept that the higher the minimum separable, or the threshold of two-ness, the lower must be regarded the visual acuity. The same notation is also familiar to us in the diopter system of expressing lens power. In both, power or acuity is expressed by the reciprocal of the relation between a focal length of lens or minimum separable and an arbitrarily chosen unit of measurement as a standard. The general equation expressing this kind of relation is  $XY = A$ , or  $X = A/Y$ , or  $Y = A/X$ . "A," which is a constant, can be any unit of measurement and any quantity, provided one of the variables

makes use of the same unit. In the diopter system the meter is the unit generally used, and the equation becomes  $D = 1/F$ . We may use 100 cm. for "A" as well; then the equation becomes  $D = 100/F\text{cm.}$  Similarly, for acuity we have the equation  $A = 1/T$ . Whether we use as a unit one-minute angle, or either of the equivalent trigonometric expressions for angles, their cotangents, whether we use the foot measure or the metric system is immaterial. Since we use the cotangents instead of angles, the usual forms of the equation are:  $V$  (Visus), or  $S$  (Sight)  $= d/D$ , or, in our foot measure  $= 20/D$  feet.

There are two important aspects to the equation  $XY = A$  that should be borne in mind when it is used. One is that it is not defined for zero. When either of the variables is zero the other becomes infinity. It is not defined, therefore, for either zero lens power or zero focal length in the diopter notation, nor is it defined for either zero acuity (or blindness) or zero minimum separabile, or threshold. The other aspect is that "A" is an "arbitrarily" chosen constant based on a unit of measurement, properly described as a standard, while the "normal" is an "obligatory" quantity imposed on us by factual data, without any relation to the former, except for the accidental use of the same unit of measurement. The statement based on the equation that 2D. is one-half 4D. has a meaning, but a statement that 2D. is one-half the normal lens power is, in terms of the equation, meaningless. Similarly, a minimum separabile of two-minute angles is twice that of one-minute angle, and the visual acuity of the former is one half of the latter; but, in terms of this equation, it is meaningless to say that the former is one-half "normal" visual acuity. That such statements occur even in such modern standard

textbooks and treatises as Fuchs's,<sup>12</sup> Henker's,<sup>13</sup> the *Traité d'Ophtalmologie*,<sup>14</sup> and Duke-Elder's<sup>15</sup> requires an explanation. This to be found in the fact that this notation was designed for purely clinical purposes. It sets a "normal" as the goal to be achieved by the clinician's therapeutic efforts, in correcting ametropias and treating diseases. Dominated psychologically by his aim he does not seriously object to saying that visual acuity of one half the *standard* is one half the *normal*. When he applies the notation to the problem of compensation, his actual knowledge of the degree of handicap a given visual acuity presents and his common-sense urge toward a graded progressive principle in compensation, which is not facilitated by the equation, make him pause and ponder.

The unsuitability of our notation for Workmen's Compensation purposes was recognized from the earliest days of the existence of the Workmen's Compensation Laws in the world. In the first period characterized by an economic approach, which regards labor as a commodity, and the worker's earning capacity as the sole criterion in compensation, an adjustment of our notation to the exigencies of the situation was made by the simple expedient of assuming a lower standard of normal vision for the industrial worker. For this purpose, without tampering with the clinically entrenched and useful visual-acuity notation, a standard or normal of two-minutes of arc was adopted, so that what we record as 20/40 visual acuity became "normal." Some even suggested a five-minute angle as "normal" for him. With the growth of a more humanitarian approach in the second period in the evolution of Workmen's Compensation, both in Europe and on this side of the Atlantic, which stresses the primacy of the depression of a human being's vital functions



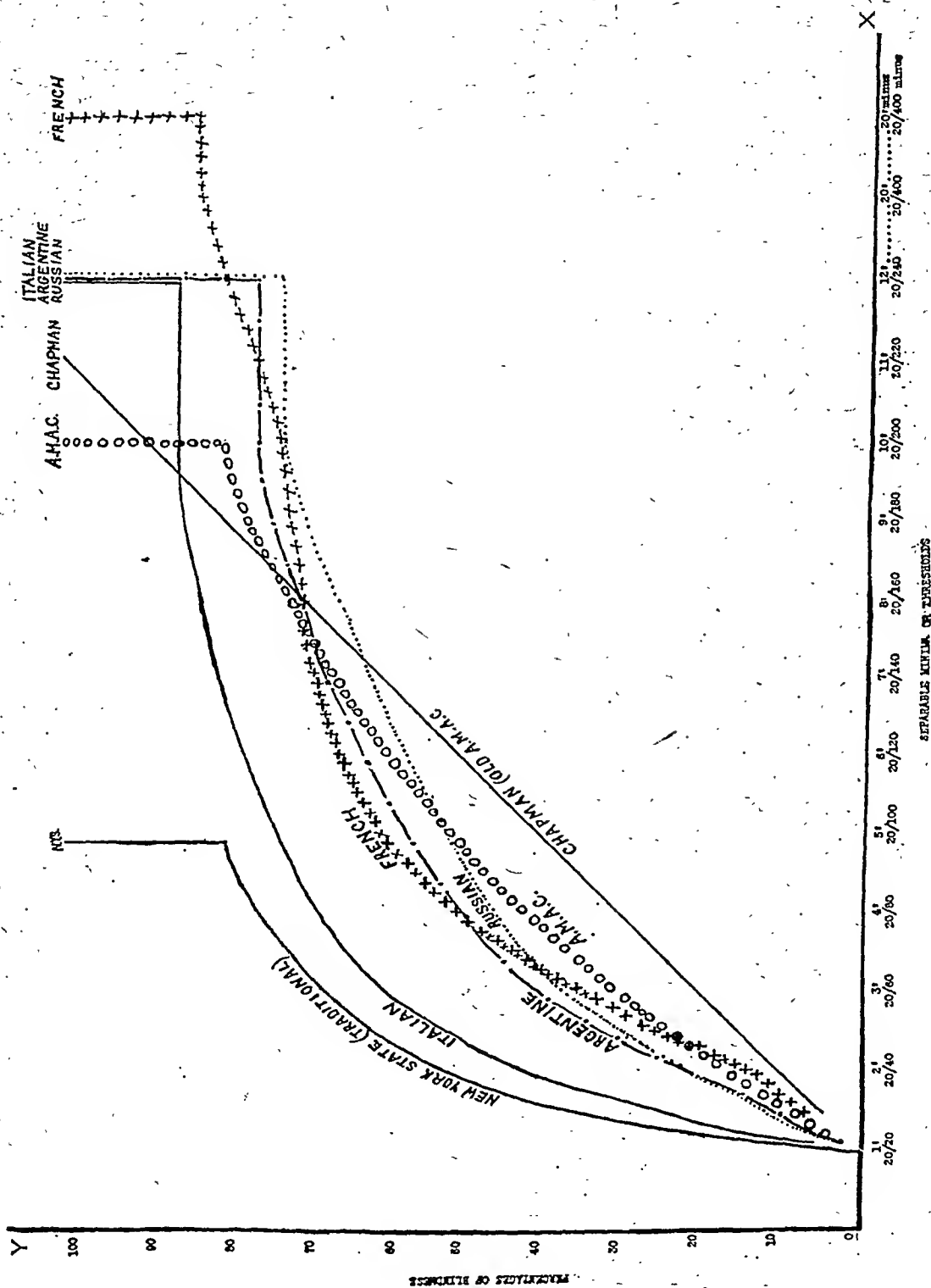


Chart. 1 (Davidson). Chart of five recently proposed (Italian, Argentine, French, Russian, and new A.M.A.C.) tables of compensation for corrected central vision for distance. To facilitate comparison the traditional table (New York State) and the Chapman (old A.M.A.C.) table have been added, and all computed to the basis of the loss of use of one eye as equal 100 percent regardless of the state of the other eye. Note that none of the graphs reaches zero point and that only Chapman line reaches the 100-percent point.

over that of earning capacity, and grants the worker the same standard normal as is found in the rest of the population, the problem of our acuity notation comes to the fore again.

The alternative to an adjustment of our notation by lowering the standard or normal is furnished by the substitution of the linear equation  $X + Y = A$ , or  $= 100$  percent, in our case for the  $XY = A$  equation. This also provides for the inverse relation between the acuity and the minimum separabile, except that instead of by division it achieves it by subtraction. It involves, of course, an agreement on two points of reference, a zero point and a 100-percent point. The method is familiar to us as the one adopted for the purpose of measuring temperature, and, if we designate a one-minute angle as the zero point of blindness, we have to deduct it from our scale and threshold found before dividing the scale into parts. We proceed similarly in employing the Fahrenheit scale by deducting 32, a quantity used as a zero point. Such a procedure was the original one suggested in 1922 by the A.M.A.C. Majority Report, except that it split the result into two parts, one to compensate for loss of visual acuity for distance, and the other for loss of visual acuity for near, and that it defined blindness as a visual acuity of 20/220. This linear equation, aside from its simplicity, satisfies our need of a graded progressiveness absent from the other equation.

The radically different tables resulting from the employment of the two equations is illustrated in chart 1 by the hyperbolic curve used by the State of New York with the old A.M.A.C. straight-line proposal. Since the charting, as well as the tabulation for table 1, was made in the interest of a more rapid orientation, directly in terms of percentages of blindness, and not inversely in those of visual acuity, the equation of the first is

$$XY = 100 X - 100, \text{ and of the second, } Y = X - 1, \text{ or } Y = \frac{220 - 20}{2}$$

Of late there is evident a tendency throughout the world toward a compromise between the hyperbolic equation and the linear equation. This is manifested not only in the new A.M.A.C. tables, based on the work of Snell<sup>16</sup> with obscuring and the application by him of the Weber-Fechner psychophysiologic principle, but also in the recent proposals by Sena,<sup>17</sup> of the Argentine; Druault,<sup>18</sup> in France; Ostrooumoff,<sup>19</sup> in the Soviet Union; and by Sabbadini and Pastina,<sup>20</sup> of Italy (table 1 and chart 1).

No two of these curves are alike, each being based on different equations. They cross each other, but evidently represent a movement in the same direction. It is doubtful whether one universally acceptable mathematical formula will ever emerge, however, from among them. Many others probably will be proposed in due course. The lack of precision in our clinically practicable measurements of the minimum separabile militates against the validity of the application of any mathematical formulae of some complexity. Wagenmann,<sup>21</sup> who reviewed this topic extensively in connection with the proposals of Magnus, toward the end of the last century, arrived at the conclusion that the "work of Magnus was unsound scientifically, impractical and Magnus' attempt to solve the problem by way of mathematical formulae has not contributed toward the solution of the problem."

With special reference to the Weber-Fechner principle underlying the new A.M.A.C. table, the applicability of the principle to the problem is doubted by Dufour,<sup>22</sup> who calls attention to the fact that a visual-acuity series is not a differential-threshold series to which only the principle is applicable, but that it may

apply to the determination of the tolerance permitted in our individual threshold determination. The validity of the principle, in general, is subject to serious

equivalent of 100 would not be affected by defining blindness as 20/240, since even if the linear formula is preferred, 20/200 represents a loss of 81.81 percent.

TABLE 1

CONDENSED TABULATION OF FIVE RECENTLY PROPOSED (ITALIAN, ARGENTINE, FRENCH, RUSSIAN, AND NEW A.M.A.C.) TABLES OF COMPENSATION FOR CORRECTED CENTRAL VISION FOR DISTANCE.\*

Percentages of Blindness												
New York State (traditional)	10	20	33.3	42.9	50	60	71.4	80 equals 100%				
Italian (Sabbadini and Pastina)	6.14	13.14	23	31.8	40	50	63.6	73	86	100%		
Argentine (Sená)	2.5	5	10.5	14.9	21	31	45.6	57	76	100%		
French (Druault-maxima)	—	—	7.2	10.6	13.3	23.3	42.4	60	73.3	73.3	83.3	100%
Russian (Ostrooumoff)	3	6	11.8	16.4	21.1	30	42.4	52	73	100%		
Amer. Med. Assoc. (new)	—	4.3	8.5	12.5	16.4	23.5	36	51.1	80 equals 100%			
Chapman (old A.M.A.C.)	—	2.5	5	7.5	10	15	25	40	90	100%		
Thresholds or Separable Minima												
	20/22	20/25	20/30	20/35	20/40	20/50	20/70	20/100	20/200	20/200 minus	20/400	20/400 minus

\* To facilitate comparison the traditional table (New York State) and the Chapman (old A.M.A.C.) have been added, and all computed to the basis of the loss of use of one eye as equal 100 percent regardless of the state of the other eye.

reservations by such writers as Luciani,<sup>23</sup> Duke-Elder,<sup>24</sup> and Pieron,<sup>25</sup> all of whom point out that it is applicable only to stimuli of medium intensities and not to high or low intensities.

In the interest of a more rapid progress toward standardization of compensation practice in the United States, and in spite of the reservations referred to, the writer would vote for the A.M.A.C. tables, which the slight modifications suggested might improve. It should be noted that the statutory requirement of any state making a loss of 80 percent of visual acuity the

#### ITEM E. HOW TO DEAL WITH THE PRINCIPLE COLLATERAL, OR AUXILIARY, ORGANS OF EYESIGHT

The term collateral, or auxiliary, to describe the apparatus of the extraocular muscles, the peripheral-vision apparatus, and that of accommodation, would seem far sounder physiologically than the term "coordinating functions" employed by the A.M.A.C., which suggest an equal essentiality and motor interrelationships that are not intended. One can hardly speak of a person as blind even with all extraocular and intrinsic muscles not

functioning and peripheral vision destroyed, but, with central vision abolished, the other organs are practically useless. Central vision is "central" not only anatomically but psychophysiologically.

These auxiliary organs are rarely involved alone as a result of injuries. Wagenmann<sup>20</sup> says in regard to one of them: "Without simultaneous loss of central visual acuity there occur major peripheral field defects only exceptionally." In the writer's experience, which covers the examination of about 50,000 claimants for compensation in the course of 15 years, the isolated involvement of these auxiliary visual functions of binocular depth perception, of peripheral or indirect vision, and of accommodation put together scarcely exceeds one tenth of one percent. The employment of a formula in dealing with them, in so far as they are impaired in association with impairment of central vision, in view of the difficulty of measuring these functions under the circumstances, is only confusing and misleading. The progressiveness in the compensation for the loss of central visual acuity, for which the newer tables provide and for which the old traditional table did not, offers an automatic method of dealing with them when they are, as is generally the case, imponderable. When they overshadow the central-vision loss, as they rarely do, the latter may be ignored and the former dealt with as if they were isolated. These functions are therefore dealt with more simply, when isolated or salient, as if they were distinct and separate entities, and are dealt with in this manner by the State of New York, which has found it satisfactory and practical.

Loss of binocular stereopsis in the whole of the motor field and irremediable, since one eye is functioning, is regarded as the equivalent of the loss of an eye, but in view of the fact that this function

comes into consideration only when central vision is useful, to appraise it as a loss of 75 percent rather than of 100 percent would seem to be more reasonable, whether the function be lost from monocular aphakia or from ophthalmoplegia. Partial loss of motor field is compensated on the basis that the lower field is more important and justifies a weight of two. Sectors are dealt with accordingly.

Homonymous hemianopia is also regarded as the equivalent of the loss of the eye, and a weight of two is assigned to the central zone of 30 degrees, as the more important one. Sectors and segments are dealt with accordingly.

The loss of the function of accommodation, since it is generally susceptible of optical correction, and the visual acuity for near is generally superior to that for distance, because of the convergence miosis, does not call for any attention in compensation. The writer so far has not had occasion to deal with it, either monocularly or binocularly, except, of course, in cases of aphakia, where it is dealt with on another basis.

#### ITEM F. THE MAXIMUM DEDUCTION FROM PERMANENT AWARD OF COMPENSATION FOR TEMPORARY DISABILITY

A statistical inquiry by the writer shows that the average period of temporary disability in ocular injuries is about four weeks, and, needless to say, there is no parallelism between the degree of the permanent loss and the temporary disability. An intraocular foreign body, for instance, may involve no loss of time and result in 100-percent loss of the eye, and a keratoconjunctivitis may cause temporary disability of several months, without any permanent loss or only a minor one. If a 20-weeks' deduction for temporary-disability compensation is practiced, as in New York State, the compensation for a

minor permanent award in many cases becomes an illusion.

Should there be a statutory deduction for temporary disability, it is proposed, therefore, that the maximum deduction in the case of ocular injuries be for four weeks, or the average of it found.

#### GENERAL CONSIDERATIONS

From the standpoint of securing a more uniform nation-wide method of

1939 that "there is not sufficient information available to permit a satisfactory estimate of the yearly total of eye injuries due to occupational accidents in the United States. . . . The National Safety Council is unwilling to estimate eye injuries in occupational accidents without further study." The present writer considers it an important function of the A.M.A.C. to organize such a survey, stimulate the publication of observations

TABLE 2

SUMMARY OF TRENDS IN INDUSTRIAL EYE ACCIDENTS IN THE STATE OF NEW YORK FOR 1925-1939 BASED ON 1940 SURVEY BY DIVISION OF STATISTICAL INFORMATION, NEW YORK STATE DEPARTMENT OF LABOR, DR. E. PATTON, DIRECTOR.

Yearly Averages

Periods	Perma- nent Totally Blind	Perma- nent Partially Blind	Temporary Disabil- ity	Cost of Awards for Eye Injuries	Average Eye Injury Award	Cost of Awards for All Injuries	Average Award for All Injuries	Eye Injuries % of All Injuries
1925-30	8	776	2189	\$1,788,534	\$593	\$30,510,214	\$304	3
1930-34	9	574	1930	1,368,403	544			2.56
1934-39	8(2.6)*	520	1265	1,046,063	583			2.74
1939	11(1)*	467**	1190†	1,074,706	644†	26,909,799	362	2.24

\* Figures in parenthesis refer to bilateral injuries, the rest being cases in which the other eye was lost earlier or later.

\*\* Exclusive of skull fractures and cases with temporary disability exceeding permanent award. Two percent are bilateral.

† Average permanent partial eye award from ocular injury is \$1,824, compared with \$668 average award for all injuries. Average industrial-blindness award is \$3,172. Of total cost of awards for eye injuries, 81 percent goes to those with industrial blindness. On basis of New York City figures analyzed in 1940, awards are made in one third of all cases examined but in 11 percent only of cases are permanent partial awards made. Annual incidence of industrial eye injuries in New York State may be estimated at 5,000, and for the U.S.A. at 50,000.

‡ Average temporary disability on basis of analysis of New York City material is about four weeks.

compensation for industrial injuries to the eyes, the A.M.A.C.'s method, with the minor modifications suggested, offers the most acceptable basis. A static frozen uniformity, however, will not answer the needs of the situation. In the United States we have had over 25 years of experience in the administration of Workmen's Compensation and in the making of awards for industrial ocular injuries, but no organized gathering of the data of our national experience nor a statistical analysis of them is available. The National Safety Council informed the writer in

and of the experiences of those actively engaged in the field of treatment and compensation for ocular injuries, and initiate the holding of national conferences devoted to the subject.

As a contribution to the subject of surveying our national experience, a summary of the experience in New York State is offered in tables 2 and 3. New York State comprises a very large sector—because of its population, industry, and commerce—of the nation's experience with Workmen's Compensation, and probably represents more than 10 percent of

it. Due to the fact that New York State has been operating with full-time ophthalmologists for nearly 20 years, and for the past 15 years with the same ophthalmologists, its data are probably the most homogeneous to be secured in the United States, and therefore of greater interest than would be those of another sector of the same size.

Table 2 shows that the number of ocular injuries per annum has been steadily decreasing for the 15-year period, so that in 1939 it was only a little over one half of what it was in 1925. While industrial injuries, in general, also show a decrease, ocular injuries show a conspicuously greater one. The relative difference is exhibited in the last column with a drop in the proportion of eye injuries to injuries as a whole from 3 percent to 2.24 percent. The annual cost also reflects the decrease and it amounts to 60 percent in 1939 of the cost in 1925. The average cost of an ocular injury, however, remains about the same. It is also worth noting that awards are made in one third of claims, but only one third of the awards are for permanent partial disability, the rest being for temporary disability only.

Table 3 represents a summary of an inquiry to determine how closely we came, in view of the preëxistence of visual defects, to meting out justice in compensation for eye injuries. The procedure adopted was to tabulate the frequency distribution of visual acuities of the injured eyes and of the uninjured eyes of the same claimants separately. It was believed that a sound criterion for a standard incidence of awards made for permanent partial disability in the total of all claims for compensation for eye injuries would be found in the difference between the incidences of all visual acuities less than 20/20 in the injured eyes

and the uninjured eyes of the same claimants. New York State compensates for any departure from a visual acuity of 20/20.

TABLE 3

INCIDENCE OF VISUAL ACUITIES AMONG 2,235 UNINJURED EYES AND 2,751 INJURED EYES OF CLAIMANTS FOR COMPENSATION EXAMINED BY THE WRITER IN NEW YORK CITY IN 1939.\*

Visual Acuities	20/13.1 to 20/20 plus	20/20	20/20 minus to loss of eye
Uninjured eyes	38%	36%	26%
Injured eyes	23%	42%	35%

\* The incidence of visual acuities better than 20/20 is based on a small number of 491 examined in 1943, which otherwise showed the same incidence, and have been added to the total and applied to the 1939 material.

The examination of these claimants was made by the same observer throughout. This difference is 9 percent. Any serious departure from this would indicate either too much liberality, on the one hand, or too much bias against claimant, on the other. Actually, as can be seen from table 2, about 11 per cent of all claims receive an award for permanent partial disability. Since the awards are under the jurisdiction of referees who are not bound by the medical opinion of the examiner, and the awards of table 2 are on the basis of individuals whereas the figures of table 3 are on basis of eyes, some discrepancy is inevitable. One may therefore consider 10 percent as a standard for permanent awards, in percentage of all claims. Any serious departure—say 20 percent or 5 percent of permanent awards—in any state, it is believed, therefore would require an explanation and may involve either error of technique of the examiner or of the judgment of the industrial board or referee or both. The problem of differentiating preëxisting visual defects from those causally related to an accident is a real one, and the desirability of having

each state employ full-time ophthalmologists for the purpose of examining claimants is obvious. The other result of this inquiry is that a considerable proportion of damaged eyes do not receive compensation, because, in spite of the damage found, they may still have 20/20 or a superior visual acuity. It will be noted that there is a shift of 15 percent in the incidence of visual acuities superior to 20/20 between the two groups, which is compensated by shifts in the opposite direction of the incidences of 20/20 and less than 20/20, and that 40 percent of that shift receives no recognition in terms of compensation. Hence the recommendation made elsewhere that compensation should begin at the slightest departure from 20/20. If we begin compensation only with reduction to 20/25 it is clear that an even greater injustice is perpetrated against the claimant.

Finally, in connection with any plan of standardization of compensation for ocular injuries in the United States, there is to be considered the problem created by vested interest. The nation-wide adoption of the A.M.A.C. tables, because of the existence of the extreme diversity of tables and methods, would benefit the insurance carriers to a considerable degree in some states, and give rise to objections on the part of labor. In other states, labor would benefit and the increased cost create opposition on the part of the carriers. In New York State, as an example,

the adoption of the A.M.A.C. schedule, would result (on the basis of an analysis of the writer's material) in an estimated saving to the insurance carriers of approximately one third of their annual cost of compensation for ocular injuries.

The only way out of this difficulty is to assume the average annual cost of compensation for ocular injuries for the past five years as given or as standard. Thus neither side could object to a more equitable distribution of this cost among the injured. Raising the amount of compensation for the loss of an eye to a given level would maintain the annual level as far as labor is concerned and involve no hardship to the carriers. In New York State, for example, raising compensation for the loss of an eye from 160 weeks to about 250 weeks would achieve the purpose. In those states where the adoption of the A.M.A.C. schedule would result in an increased cost, either reducing compensation for the loss of an eye (where it is higher than 25 percent of permanent total disability) or else an overall deduction of a certain percentage from each award might meet the situation.

In the final analysis of the problem the goal of Workmen's Compensation should be prevention of accidents rather than stressing the problem of cost or benefits. This goal, as we have seen, is being approached and more can be done in that direction.

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## EXPERIMENTAL AND CLINICAL STUDIES ON CERTAIN SAFETY FACTORS IN CLOSURE OF CATARACT INCISIONS

### RESULTS IN 187 OPERATIONS

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This report gives the results, during the past 10 years, of two different types of cataract operations that were developed on the experimental studies cited below and on previous clinical experiences in India. Two hundred and two eyes were operated on during this period. Fifteen of these were of traumatic or of congenital origin and are omitted. The other 187 are included in this report.

### EXPERIMENTAL

#### *A. Physical qualities of the cornea.*

Comparative physical qualities of the cornea and sclera were observed in a few simple experiments<sup>1</sup> which were suggested by the late Edward Jackson. The results indicated that the cornea is characterized by flaccidness and when deformed has very little tendency to return to its previous shape. The resilience of the cornea appeared to be very limited, whereas the sclera exhibited this quality to a considerable degree.

*B. Mechanics of iris prolapse.* A series of observations and tests<sup>2</sup> were made upon the iris of a number of patients in India. An optical iridectomy was to be performed upon all of these patients and the observations and tests were made upon that sector of the iris which was about to be resected. Prolapse of this portion of the iris was purposely produced. It was found (as is already known) that prolapse was caused by the aqueous in the posterior chamber and that it followed a definite succession of steps<sup>2</sup> which are shown in figure 1.

All of these steps occurred very quickly as pressure was applied. Had they not occurred quickly, the aqueous in the posterior chamber would have seeped away between the iris and cornea, and prolapse would have been incomplete or would not have occurred at all. It was necessary, in order to produce a complete prolapse with collapse of the balloon, that a minimum quantity of aqueous be present and that



a minimum pressure, which was sustained throughout the brief period required for the aforementioned steps, be applied. If either the volume of aqueous or the

amount or duration of the pressure were insufficient, an incomplete prolapse would occur, the degree of which depended upon the summation of these factors.

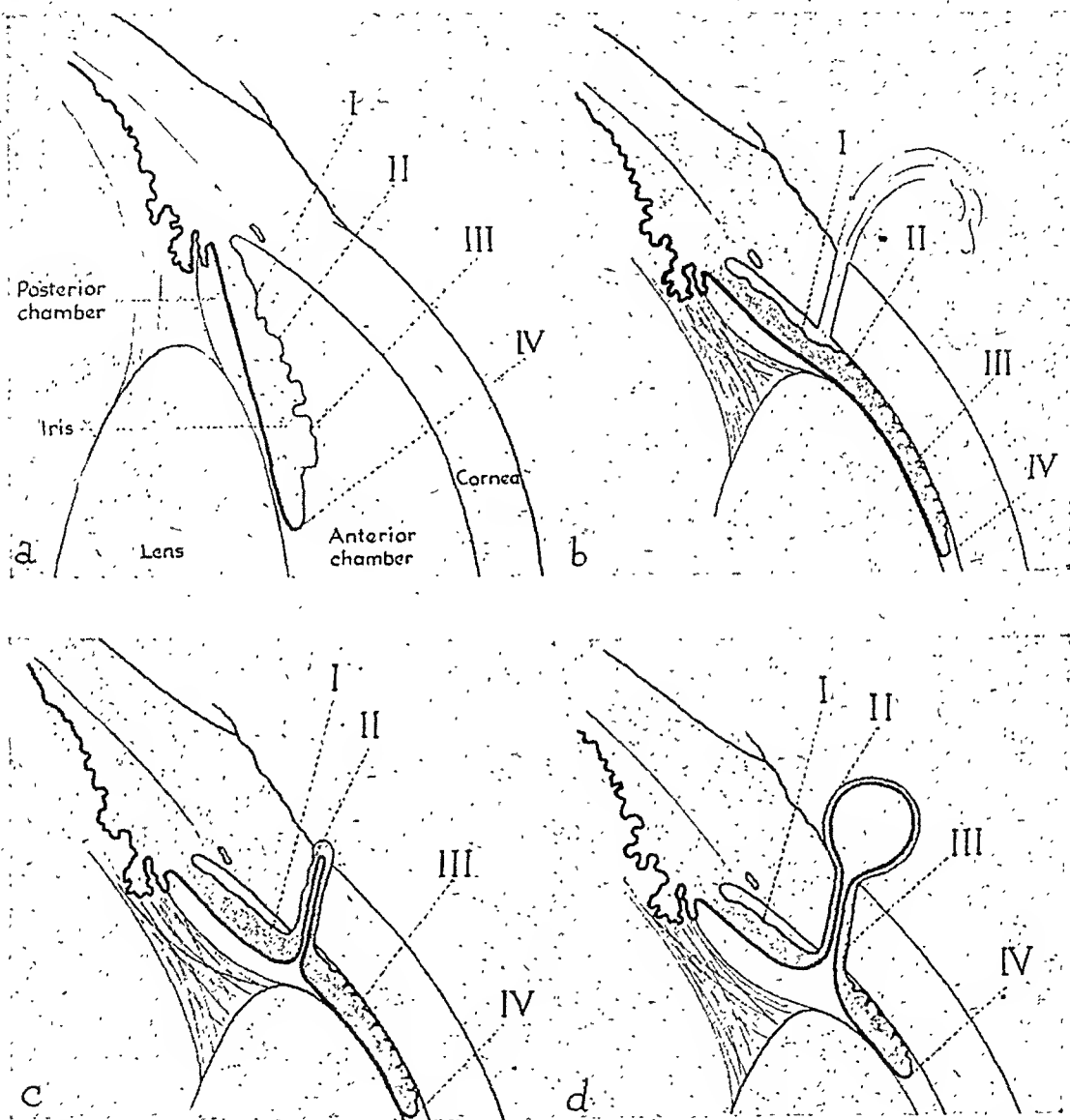


Fig. 1 (Hilding). Steps in prolapse of iris. a, normal relation of structures involved. Observe points I, II, III, and IV in the remaining sketches.

b. Step 1. Corneal break occurs and aqueous in anterior chamber escapes. Step 2. Iris and lens move forward into the anterior chamber. The iris forms a water tight seal as it is pressed against the posterior corneal surface, thus preventing the escape of the aqueous in the posterior chamber.

c. Step 3. Entrapped aqueous in the posterior chamber forces the iris ahead of it between the lips of the wound. If pressure should cease at this point, incarceration would result. Prolapse of iris, grade 1.

d. Step 4. That portion of the iris between the break and the pupil slides into and through the break, forming a balloon. The portion between the break and the iris root remains stationary. If pressure should cease at this point progress of iris would cease and a small prolapse would result. Prolapse of iris, grade 2.

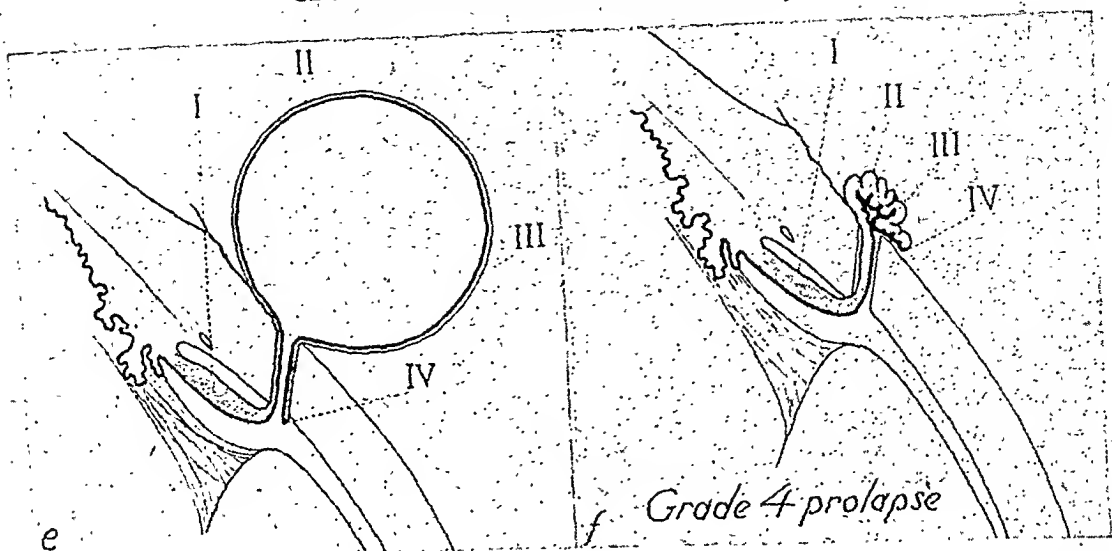


Fig. 1 (Hilding). e. Step. 5. Balloon grows progressively to maximum size and involves all of the iris between the break and the pupillary margin. If pressure should cease at this point the largest herniation would result. Prolapse of iris, grade 3.

f. Step 6. Margin of the pupil slides through the break liberating the aqueous from the posterior chamber and allowing the balloon to collapse. A large incarceration results. Prolapse of iris, grade 4.

*C. Prevention of iris prolapse by peripheral iridectomy.* After the aforementioned steps had been determined, tests were made to learn whether or not the sequence of events could be halted or prevented by means of a peripheral iridectomy. In a series of cases, a small iridectomy\* was made immediately following the corneal section, as gently and quickly as possible. Prolapse failed to occur upon application of pressure in those eyes in which the iridectomy coincided with the corneal incision. The aqueous escaped from the posterior chamber through the iridectomy as pressure was made upon the eye, but the iris remained in place (fig. 2). If the peripheral iridectomy lay central to the incision, how-

ever, the steps of prolapse would be initiated and would proceed until the iridectomy came into the incision. Then the aqueous escaped and progress of the iris ceased. A varying degree of incarceration resulted (fig. 3). [A peripheral iridectomy placed in the root of the iris (fig. 1, point 1) posterior to the incision would be sealed as effectively as the pupil and would not prevent prolapse.]

*D. Production of iris prolapse in the laboratory.* Ox eyes were prepared and mounted in such a way<sup>3</sup> that prolapse of iris could be produced at will.

The steps of prolapse as observed in man were corroborated, as was the action of peripheral iridectomy in preventing it.

*Gradation of iris prolapse.* For the sake of clarity, iris prolapse is divided into four grades (fig. 1). Grade 1 is that degree of herniation which forces the iris between the lips of the wound and causes it to appear as a dark spot or line in the line of incision. Grade 2 is that degree which causes a definite, small-sized balloon. Grade 3 consists of a large balloon,

\* This iridectomy was smaller than the usual peripheral iridectomy. It was made as small as possible. Only the anterior fibers were grasped in the tips of a Kalt forceps and the very smallest amount possible was excised as the forceps tented the iris. It is necessary only to penetrate the iris. The peripheral iridectomies used in the cataract operation were also of this type.

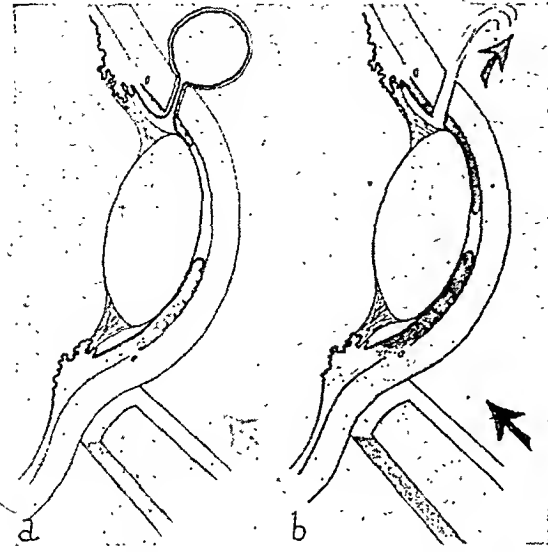


Fig. 2 (Hilding). a, prolapse of iris purposely produced as one step in optical iridectomy at Shikarpur, India. After making the section with a Graefe knife, the surgeon would turn his knife and made quick pressure with the end of the handle. b, a tiny peripheral iridectomy which coincided in position with the corneal incision would effectively prevent prolapse. The aqueous would escape from the posterior chamber in a little squirt after which prolapse could not be produced. The iris would remain stationary.

and grade 4 the status after the pupillary margin has passed through the wound and allowed the aqueous to escape from the balloon. In grade 4, there remains a large incarceration in the wound and the pupil is drawn strongly toward the prolapse. Grade 4 would not be so serious a complication after cataract operation as would grade 3.

*E. Efficiency of wound closure.* The capacity of limbic incisions to withstand pressure under certain circumstances was measured on the ox-eye preparations.<sup>3</sup> Tests were made with (a) the wound open; (b) the wound covered by a conjunctival flap; (c) wound closed with a corneoscleral suture; and (d) same as (c) with peripheral iridectomy added. It was found that the incision covered by a conjunctival flap could resist pressure slightly better than could the open incision. When closure was made by cor-

neoscleral suture, five times as much pressure was required to make the wound give way as when the conjunctival flap was used. Prevention of prolapse was further assured by the addition of peripheral iridectomy.

### CLINICAL

There was opportunity in India to see iris prolapse and gaping of wound frequently in the great volume of cataract surgery done there. It was observed that full iridectomy was not a guarantee against this complication. One iris column or the other prolapsed now and then. Neither was one, two, or even three peripheral iridectomies without sutures certain to prevent prolapse. It was seen to occur with a single and with two corneoscleral sutures. Prolapse occurred once at an angle when a full iridectomy had been performed and two corneoscleral sutures had been used.

*Rule governing iris prolapse.* From

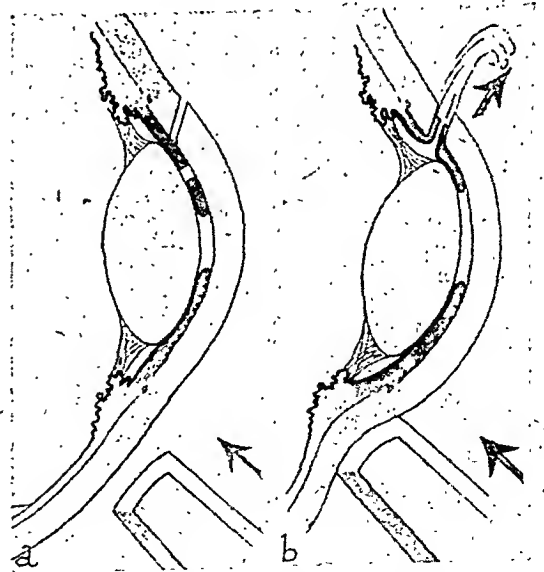


Fig. 3 (Hilding). a, when a peripheral iridectomy was made central to the incision, and pressure applied to the eye as in figure 2, the iris would slide toward the incision as in formation of prolapse until, b, the iridectomy slid into the incision. The aqueous of the posterior chamber would escape, progress of iris would cease, but it would remain incarcerated.

these observations, the following rule was formulated: When a sudden breach occurs in a cataract incision, iris prolapse will follow if there is: (a) sufficient intact iris to cover the breach, (b) sufficient force to push out the aqueous of the posterior chamber, and (c) sufficient aqueous present to extrude the iris.

Either one of two things is essential to prevent gaping of wound and iris pro-

sures would seem to be feasible if the incision were protected at perhaps five points.

### OPERATIONS

Two operations based upon these observations were devised. The incision was closed with two corneoscleral sutures and further protected by three peripheral iridectomies,\* in the first operation. One

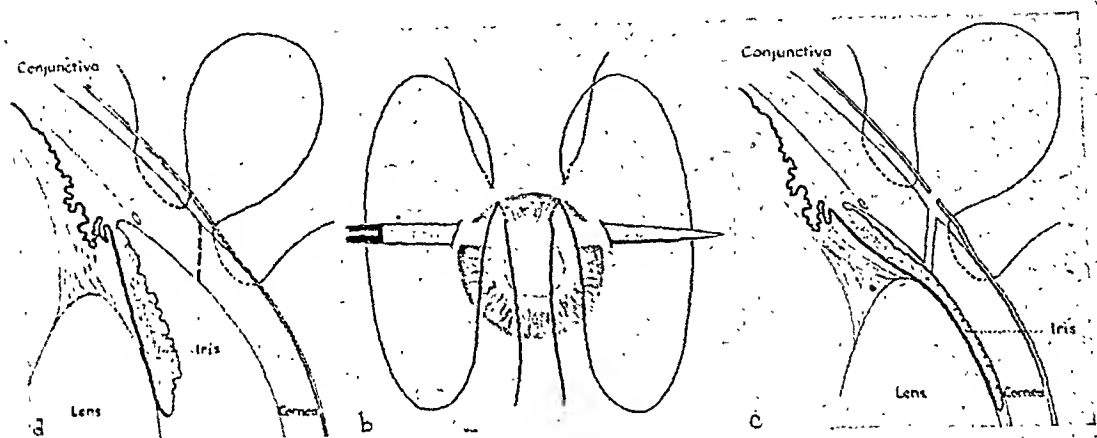


Fig. 4 (Hilding). Steps in placing sutures and making incision in the first operation. a, method of placing the sutures to include fixation of the conjunctiva to the sclera. b, incision at the limbus made within the loops of the sutures. c, relation of cornea, sclera, conjunctiva, and suture after limbic incision.

lapse; namely, either to close the wound so securely that it cannot be breached or to provide a means for the harmless escape of aqueous.

It appears from these clinical experiences that one corneo-scleral suture can be depended upon to prevent gaping in roughly 25 degrees to 35 degrees of the arc of the incision. An iridectomy or iridotomy seems to guard 5 to 10 degrees of the arc on either side from iris prolapse. If this is true, then at least four corneoscleral sutures would be necessary in an arc of 140 degrees to close a cataract incision securely. Peripheral iridectomies alone could not be depended upon unless as many as six or eight were used, and this would hardly be practical. A combination of peripheral iridectomies and

hundred and five eyes were operated on by this method from 1934 to 1941. No iridectomies nor iridectomies of any kind were used in the second operation. Instead, the incision was closed by four corneoscleral sutures. Eighty-two eyes were operated on by this method during the years 1941 to 1944.

*Operation with multiple peripheral iridectomies (first operation).* This operation was described briefly in 1939.<sup>2</sup> The distinctive features are two corneoscleral sutures that are put in place before the section is made in a manner similar to the method described by Verhoeff,<sup>4</sup> and three peripheral iridectomies distributed,

\*These are made as small as it is possible to make them and still penetrate all layers of the iris.

respectively, in the 10-, 12-, and 2-o'clock meridians. The sutures are placed by first taking a small radial bite in the cornea very close to the limbus. A second bite is then taken about 1 mm. posterior to the first, and, passing into the sclera, penetrates the conjunctiva twice, thus fixing it to the sclera (fig. 4a). The suture between the two bites is formed into a loop that is laid to one side. Two such sutures are used, one in the 11- and the other in

the tips of a Kalt forceps, drawing it into the incision and excising with a de Wecker scissors the smallest bit that will penetrate the layers of the iris (fig. 5a).

The lens is then routinely extracted intracapsularly through a round pupil by combined traction and external pressure in about the standard manner. The lens capsule is grasped just below the center with a modified Arruga capsule forceps and tumbled as pressure is made below

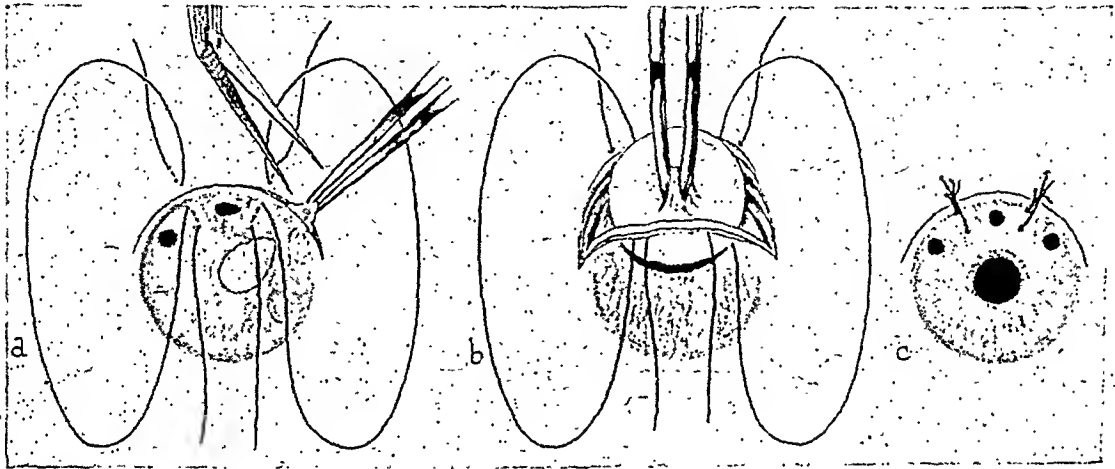


Fig. 5 (Hilding). a, positions and method of making the three peripheral iridectomies. They are placed in the iris on an arc to correspond with the incision. If they were made to lie peripheral to the incision at the root of the iris, they would be useless. b, the lens is delivered by combined external pressure and traction through a round pupil. c, appearance of sutures, iridectomies, and pupil at the end of the operation (first).

the 1-o'clock meridian. The limbic incision is made with a Graefe knife that is manipulated within the loops so as to come out between the two bites of the sutures (fig. 4b). The conjunctiva is divided as the incision is made (fig. 4c). If the iris should balloon over the edge of the knife during the incision it need not be cut, but can be pushed back out of danger by an iris repositor entered into the anterior chamber along the posterior surfaces of the knife.

The three peripheral iridectomies are next made at the 10-, 12-, and 2-o'clock meridians by grasping the anterior surface of the iris as delicately as possible with

with a large strabismus hook. Most of the delivery is effected by pressure, but traction is used toward the end in order to avoid folding the cornea under the lens as it passes through the pupil (fig. 5b). (Folding the cornea enhances post-operative wrinkling of Descemet's membrane.)

This operation proved to be highly satisfactory in the 105 eyes upon which it was used. It had the disadvantage that the anterior lip of the incision might override if the sutures were tied too tightly. Also it was found that radial distortion was possible unless both bites of the sutures were in exactly the same radius. Some of my confrères objected to so many

iridectomies on the grounds that they made the operation more difficult and complex.

*Operation without iridectomy or iridotomy (second operation).* It was thought, following experiments on the various types of wound closure, that an operation without any iridectomy or iridotomy would be safe and practicable if a sufficient number of corneoscleral sutures were used. An operation was planned to avoid the aforementioned ob-

Fixation for this step is made on the sclera with an Elschnig fixation forceps in the 1:30-o'clock meridian. Rotation becomes so great when 10 o'clock (fig. 6a, point B) is reached that the incision cannot be carried farther without changing fixation. This is usually unnecessary because the groove which extends to the 10-o'clock meridian is long enough to accommodate the four sutures. It is best to make the groove incision with one sweep of the knife. However, if it is not deep

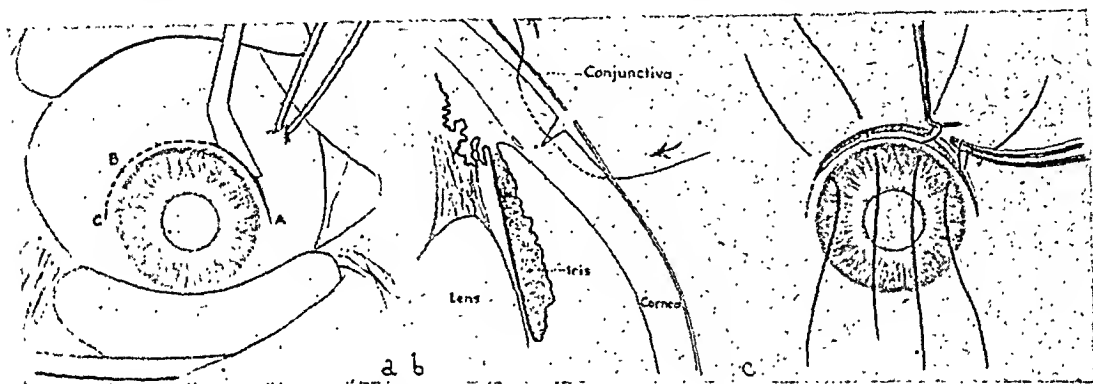


Fig. 6 (Hilding). Steps in placing sutures in second operation. a, a groove incision is made at the limbus half way through the wall of the eye with a Curdy or Lundsgaard knife and with scleral fixation. The conjunctiva is incised at the same time, but no flap is made. b, four sutures are placed across the groove including the conjunctiva as indicated. c, the four sutures are picked up in the groove one by one and hung over a small thumb forceps.

jections. In it four corneoscleral sutures are used and the iris is left entirely unimpaired. This operation has been used since 1941.\*

The essential steps are as follows: A groove incision is made just at the limbus half way through the wall of the globe by means of a Curdy or Lundsgaard knife (or modification) (fig. 6a) for two fifths of the circumference. The knife is held vertical to the eye in order that the groove incision will be at right angles to the surface. As the knife is moved along, the conjunctiva is divided close to its insertion, but no conjunctival flap is made.

enough, the knife may be passed again. Four silk corneoscleral sutures are placed across this groove (fig. 6b, c) in such a manner as to be evenly spaced on the line of the completed incision (much after the manner of McLean<sup>6</sup>). When the needle is passed into the cornea, the point is brought up into the groove so that it can actually be visualized before it is depressed again and passed into the sclera. If this precaution is omitted, it is very easy to pass the suture too deep in the groove, in which case it cannot be picked up. The conjunctiva is included by passing the needle through it as the latter emerges from the sclera (fig. 6b). When all four sutures are in place, the threads are picked

\* A very similar procedure was described in 1945 as the Lancaster operation.<sup>5</sup>

up one by one, beginning from the nasal side, by means of a small hook and are hung over a small thumb forceps (fig. 6c). The forceps is then rested upon the bridge of the nose. As it is released, it springs open and the four sutures form four taut loops that spread the edges of the groove and can be used for purposes of fixation (fig. 7 a, b). Any one of several forceps may be used for this purpose.

maneuver by grasping the forceps, which carries them, at the very hilt (fig. 7c). They spread the incision progressively and widely as the scissors moves along, thus exposing the iris to direct view. The jaws of the thumb forceps are closed when the scissors incision has been completed, thus slackening the loops. The two temporal loops are pushed off the forceps with the closed scissors and laid upon the

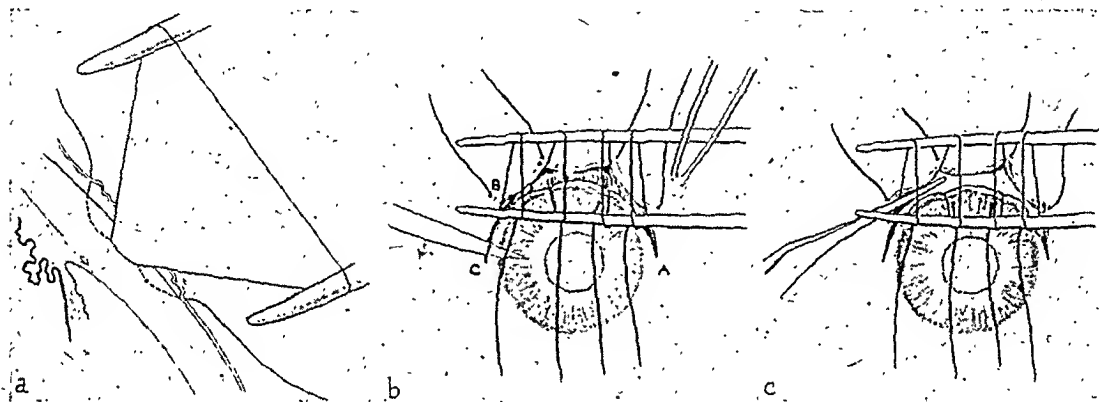


Fig. 7 (Hilding). Manner in which the sutures are used in completing the incision. a, the groove is spread by the taut loops of the sutures. There is ample room in which to manipulate the corneal scissors without cutting the sutures. b, the anterior chamber is opened by entering a Graefe knife at B and cutting down to C. Fixation may be either by Elschmig forceps or by the four loops of sutures. c, one blade of a corneal scissors is entered through the incision just described and groove incision completed into the anterior chamber for the full length, cutting within the loops. Fixation is made with the thumb forceps carrying the four loops of suture. Injury to the iris and lacerations of Descemet's membrane by means of the scissors must be avoided.

The chief requirements are that the forceps be about 10 cm. long and that jaws be slender, smooth, and curved.

The anterior chamber is now entered at the temporal extremity of the groove near the outermost suture by means of a Graefe knife. The knife is entered with the edge down and the tip carried in about to the pupillary margin and then cutting downward, is withdrawn (fig. 7b). The opening that results is sufficiently large to admit one blade of the corneal scissors. The incision is completed into the anterior chamber for the full length by means of the scissors, cutting in the bottom of the groove within the loops of the sutures. The loops are used as fixation during this

lateral sclera. The other two loops are laid on the medial side simply by withdrawing the forceps (fig. 8a).

The lens is extracted in the capsule through the round pupil as in the first operation. No iridotomy nor iridectomy of any kind has been used until recently, as will be explained later.

After the lens has been delivered the sutures are all tied unless the anterior chamber is to be irrigated or air injected, in which case one is left untied until this is done (fig. 8b). The anterior chamber is irrigated if any pigment has been separated from the iris by the manipulations of the lens. Air is often injected into the anterior chamber for the purpose of hold-

ing the iris away from the incision and sometimes seems to be of value. Eighty-two eyes were operated upon by this method and the results have been highly satisfactory.

*Advantages of corneoscleral sutures.*

Corneoscleral sutures are not easy to insert, but as a method of wound closure as used in these operations, they have distinct advantages. The wound seals immediately, allowing the intraocular pres-

sure to be ideal. The iris is left entirely unmutilated and the pupil is round and central. The apposition is perfect (it would be difficult to avoid accurate apposition) and overriding of the lips of the wound is impossible. Therefore astigmatism is reduced to a minimum. The wound is tightly sealed and the anterior chamber refills quickly. The wound is strongly closed and will withstand all ordinary stresses.

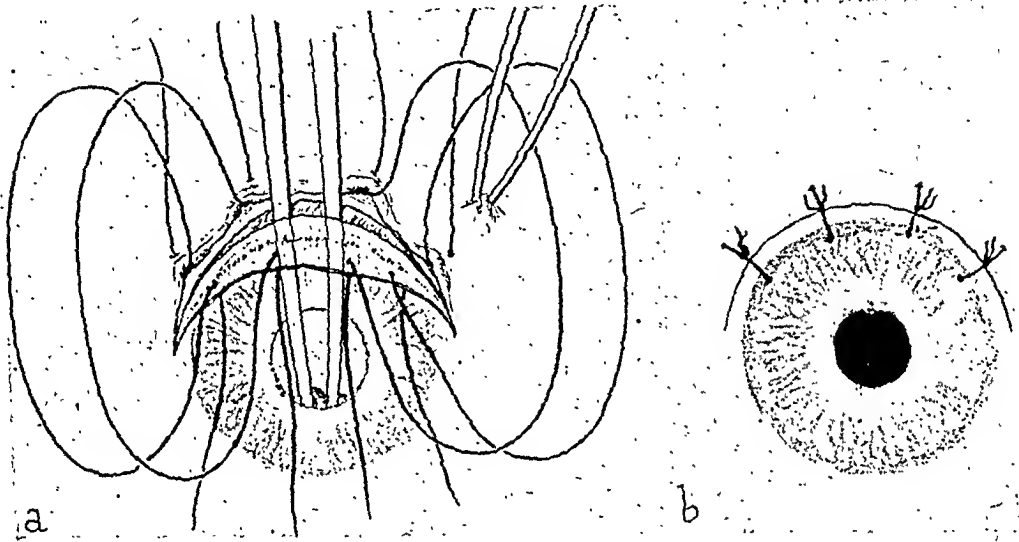


Fig. 8 (Hilding). a, incision completed and the loops of suture laid to either side. Lens delivered intracapsularly through a round pupil by means of combined external pressure and traction. b, appearance at end of second operation. Incision closed and sutures tied. Air may be injected into the anterior chamber before the final suture is tied.

sure to return to normal quickly. The patient escapes the discomfort and danger of immobility in bed. Since the wound is tightly closed, he is allowed considerable freedom of motion beginning immediately after operation, and he is out of bed on the second postoperative day. Diet restrictions are largely unnecessary. Bowel movements can be had regularly using enemas if necessary. Serious iris prolapse and gaping of wound postoperatively is eliminated.

*Comparison of operations with and without iridectomies.* The status after the operation without iridectomies would

There are some disadvantages, however. The added manipulation required to introduce the sutures and to make the incision increases postoperative reaction somewhat. Four knots make more irritation during convalescence than do two. The sutures are more difficult to remove than are those of the Verhoeff type. Neither is the closure foolproof. The flaccid nature of the cornea makes it almost impossible to close a wound so tightly that the aqueous can under no circumstances escape. The stresses to which eyes are subjected postoperatively vary greatly and "safe closure" is a relative term. After



all, it is entirely possible to burst a normal, intact eye if it is struck with sufficient force. I have such a case under my care at present. The patient fell in the bathtub, striking one eye against the water tap with such force that the sclera burst and the lens was extruded. The eyes of two of the

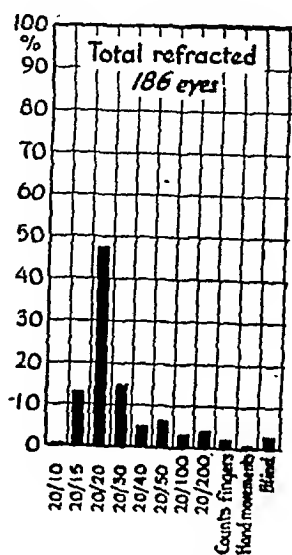


Fig. 9 (Hilding). Visual results in 186 eyes. Seventy-five percent obtained essentially normal vision (20/30 or better). When 27 eyes afflicted with retinal disease or other pathologic conditions unrelated to cataract or the operation are excluded, 88 percent of the remaining 159 eyes attained to 20/30 vision or better.

patients operated on without peripheral iridectomy were subjected to such extraordinary stresses that the iris was forced in between the lips of the incision in all of the spaces between the sutures. One patient who was sleeping in an open alcove next to a hallway was awakened from a sound sleep during her first postoperative night when a nurse dropped a bed pan on the terrazzo floor. She was startled out of her sleep and sat bolt upright in bed. The other patient developed a migraine headache the day after operation and became hysterical and wept uncontrollably. In both cases all of the sutures held, but the flaccid cornea bowed under the stress even in the small arcs between

the sutures, allowing the iris to become incarcerated between the sutures. Both patients were returned to the operating room and the iris was replaced, and both obtained good final results.

The second operation has been modified somewhat because of these experiences. The two central sutures are placed a little farther apart, so that if the wound is subjected to such stress that it must give way, it will do so at or near the 12-o'clock meridian. A tiny peripheral iridectomy is then made at 12 o'clock, so that the aqueous from the posterior chamber may escape harmlessly.

*Postoperative care.* The postoperative care is identical in both operations and is quite simple unless there are complications. The eye is dressed daily, beginning the morning after operation. Diet is unrestricted unless some special condition like diabetes is present. It is made to imitate the patient's food habits at home as far as is practicable. The patient may have the head of the bed raised immediately after operation and on the following day may sit up in a chair. The stitches are re-

TABLE 1  
INCIDENCE OF INCARCERATION AND PROLAPSE OF IRIS

Degree of Involvement	Operation 1	Operation 2
Grade 1 Incarceration or very tiny prolapse	2	4
Grade 2 Small prolapse	0	0
Grade 3 Large prolapse	0	0
Grade 4 Large incarceration	0	0

There were no instances of serious iris prolapse. There were two instances of grade-1 prolapse among those operated on by the first method (multiple peripheral iridectomy) and four in the group operated on by the second method (four corneoscleral sutures and no iridectomy). The grading is illustrated in figure 1 (c, d, e, f).

moved routinely on the eighth day, under cocaine anesthesia and with aseptic precautions. The patient leaves the hospital on the tenth day.

If the capsule is ruptured during ex-

traction without iridectomy. The two groups are so small in number that the difference is thought not to be significant. Considering all together as one group (one patient was never refracted), it was found that

### Postoperative astigmatism

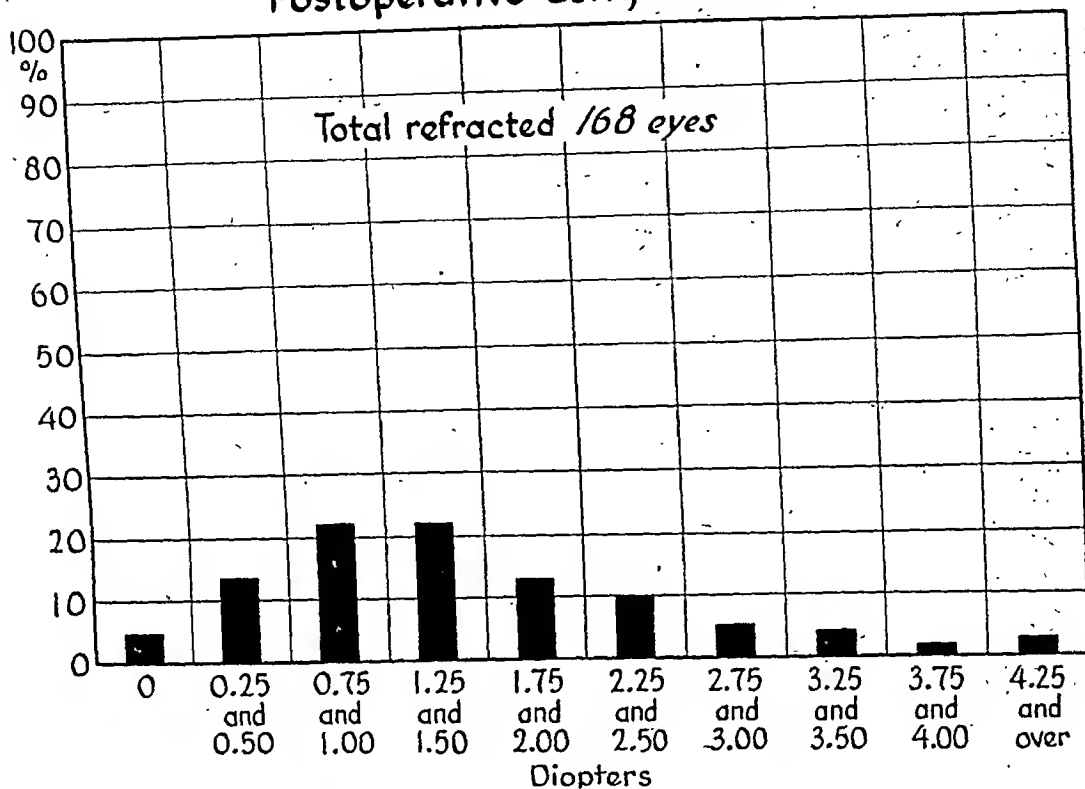


Fig. 10 (Hilding). Astigmatism after operation was relatively small, 62 percent having less than 1.75D.

traction of the lens, atropine is instilled daily as a routine.

#### RESULTS

*Incarceration and prolapse.* The results of gaping of wound and prolapse are given in table 1. There were no occurrences of grades 2, 3, or 4 with either operation. There were two instances of grade 1 (incarceration, or pinpoint herniation) after the first operation and four after the second operation.

*Visual results.* The visual results averaged a little better following the multiple-iridectomy operation than after the opera-

tion without iridectomy. The two groups are so small in number that the difference is thought not to be significant. Considering all together as one group (one patient was never refracted), it was found that

75 percent attained to normal, or near-normal, visual acuity; that is, 20/30 or better (fig. 9). Sixty percent attained to 20/20 or better. When those eyes in which visual acuity was reduced on account of other pathologic conditions unrelated to the operation (retinal pathologic change and the like) are excluded, the results were still better. There were 27 such eyes. Excluding these, 88 percent of those remaining attained to 20/30 vision or better and 70 percent obtained 20/20 or better.

*Postoperative astigmatism.* The low degree of postoperative astigmatism was a

Distribution of axes of astigmatism

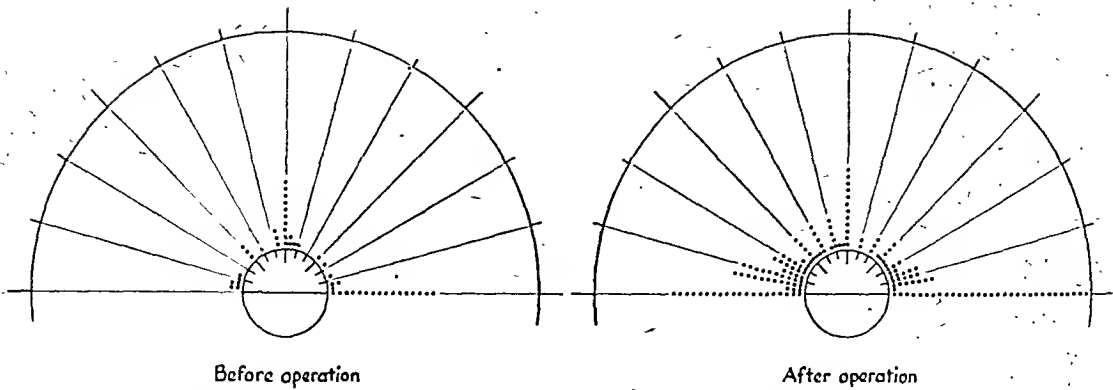


Fig. 11 (Hilding). Graph showing the distribution of astigmatism according to axes before and after operation. Each dot represents one eye. Unfortunately preoperative records were often unavailable. The postoperative astigmatism tended to be against the rule, indicating a flattening of the corneal curve by the incision.

Method of lens delivery

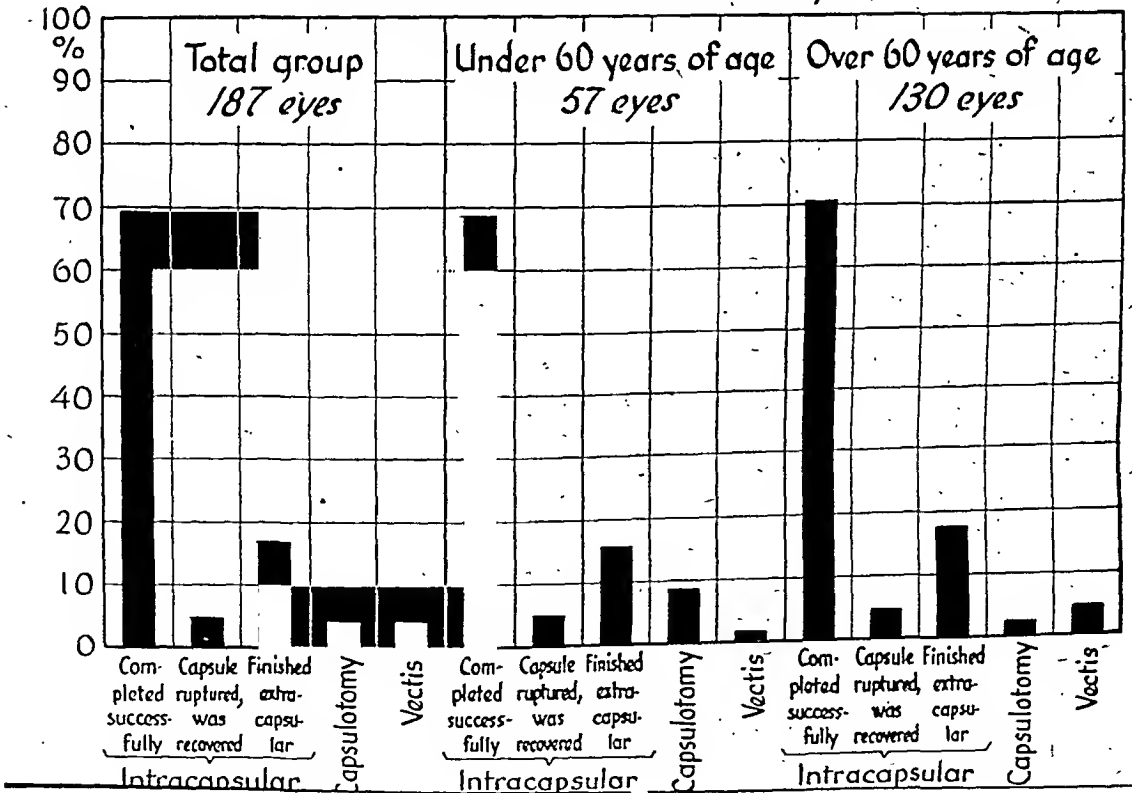


Fig. 12 (Hilding). Method of lens delivery used. Intracapsular extraction was attempted in about 90 percent and completely successful in about 70 percent. The capsule was recovered complete in another 5 percent in which it ruptured during extraction. There was very little difference in the percentage of successful intracapsular extractions in the group below 60 years of age as compared with those above 60.

the same percentage as in the group over this age (fig. 12).

## SUMMARY AND DISCUSSION

The cornea is characterized by flaccidness, whereas the sclera displays considerable resilience. Because of this flaccidness of the cornea, it seems probable that no type of closure of a cataract incision with

be against the rule more often than pre-operative astigmatism.

corneoscleral sutures will be successful in all cases in preventing gaping of the incision between the sutures with some degree of incarceration of the iris. This being the case, it would seem to be the part of prudence to space the sutures in such a way that if the eye is subjected to pressure and the wound gapes, it will always open at a predetermined spot. A tiny peripheral iridectomy should then be made in this meridian.

Iris prolapse may occur at any point where a sealed incision suddenly gives way, if the break can be covered by intact iris after the anterior chamber has emptied. Iridectomies or iridotomies in

some other meridians are of no avail in preventing prolapse. An iridotomy made at the root of the iris posterior to the incision would be useless and might even encourage prolapse. Prolapse is caused by the aqueous in the posterior chamber seeking to escape through the break in the incision. If there is a hole through the iris

through which the anterior chamber empties itself. (2) The iris presses forward against the posterior corneal surface, forming a relatively watertight seal which entraps the aqueous in the posterior chamber. (3) This aqueous is pressed into the incision and rolls the iris before it. (4) That portion of the iris which lies central

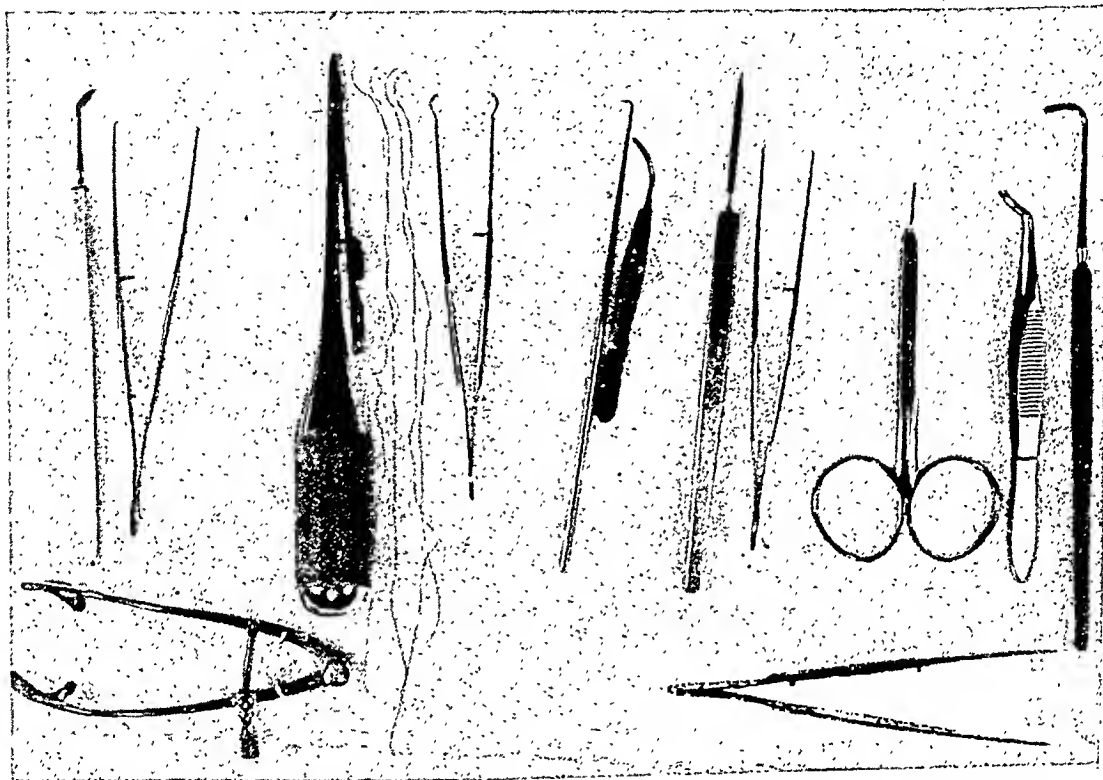


Fig. 14 (Hilding). Instruments used in the operation without iridectomy (second operation). They are grouped according to the steps in the operation: (1) groove incision made at limbus by means of a Curdy (or Lundsgaard) knife with scleral fixation; (2) four corneoscleral sutures placed across the groove; (3) suture picked up by hook and hung over a forceps thus making four loops; (4) anterior chamber entered by means of Graefe knife making only a very short incision; (5) incision completed by means of a corneal scissors; (6) lens extracted; (7) sutures tied.

at the point where the break occurs, the aqueous will escape harmlessly without herniating the iris. If, however, there is enough intact iris to cover the break and enough pressure to force out the aqueous, prolapse of iris will occur.

Prolapse of iris, when it occurs, passes through a definite series of steps in sequence: (1) A break occurs in the incision

to the incision, slides progressively upon the posterior corneal surface, into and through the break. (5) As it appears outside the incision it forms a balloon filled with aqueous which, if pressure continues, grows progressively in size until (6) the pupillary margin slips through the wound, causing the balloon to collapse as the imprisoned aqueous escapes.

Gaping of wound and iris prolapse were largely eliminated in this series with both of the described operations. There were six cases of incarceration (grade-1 prolapse) but no instance of grades 2, 3, or 4. It is thought that even these minor incarcerations can be largely eliminated by placing a tiny peripheral iridectomy at that sector where provision has been made for gaping of the wound in case of extraordinary stress.

The visual results were uniformly good. About 75 percent of patients in the whole series attained to 20/30 or better. When those having other preëxisting pathologic change which interfered with vision were eliminated, it was found that about 90 percent received normal or nearly normal acuity. Those under 60 years of age

averaged slightly better as to visual results.

Postoperative astigmatism was found to be of low degree. Sixty-two percent showed 1.50D. or less, and 85 percent had not over 2.50D. The axes were predominantly against the rule.

Intracapsular extraction was attempted in about 90 percent and was completed successfully in 70 percent. The ruptured capsule was completely recovered in another 5 percent. There was very little difference in the success of intracapsular extraction in those under 60 years of age as compared with those over that age.

The pupillary sphincter was preserved in over 80 percent. The final shapes of the pupil are recorded diagrammatically in figure 13.

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# SURGICAL RECONSTRUCTION OF THE UPPER LID

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Surgical reconstruction of the eyelids is today a matter of prime interest. The history of blepharopoesis has been consummately reviewed by Hughes,<sup>1</sup> whose method of partial or total reconstruction of the lower lid constitutes a distinct advance in procedure. At the time of this writing, case reports have been limited to the lower lid. Of six cases of practically total blepharopoesis, which I have carried out using Hughes's method, five followed surgical excision of one lid because of malignant growth and one, traumatic excision of almost all of the upper lid with a pocket knife. Beside the latter case, one of those surgically treated for malignancy involved reconstruction of the upper lid.

Since Hughes's reported cases pertained primarily to the lower lid, the question has remained, how applicable his method is to the upper lid. The review of his monograph in the *Journal of the American Medical Association*<sup>2</sup> states: "While probably lower lid lesions and defects are by far the more common, yet one would welcome authoritative advice on the repair of the occasional upper lid defect." In the first stage of Hughes's procedure, after excision of as much as the entire lower eyelid, the skin of the cheek is undermined sufficiently to allow it to be brought up to the level normally occupied by the lower lid, without tension. The upper lid is then split into two layers, the outer layer consisting of orbicularis and skin and the outer portion of the lid margin including the lashes; the inner layer, tarsus and conjunctiva. This transverse dissection extends from the lid margin, where care must be taken not to injure lash follicles, to a line even with the limit of the upper fornix, about 3 mm.

above the upper margin of the tarsus. It is well not to disturb the attachment of the levator to the tarsus. The lower epithelial border of the tarsal layer is excised and the newly formed edge united to the cut conjunctival margin best by a single running silk suture. The previously undermined skin of the cheek is then drawn upward and sutured to the anterior surface of the lower half of the tarsus by three double-armed silk sutures which are tied over rubber tissue on the skin surface. The superficial layer of the upper lid is then reattached in its new position, similarly, to the upper half of the tarsus, and the two edges of the skin are united by a subcuticular stitch. Gifford<sup>3</sup> advises leaving openings in both the inner and outer angles for later through-and-through drainage if secretion is marked. Direction of the lashes is secured by fastening them down, pointing upward on the skin, with collodion. A pressure dressing is applied over rubber tissue and left in place for six days. In the second stage, approximately six weeks later, a narrow strip of full-thickness hair-bearing skin from the opposite eyebrow is transplanted into the area which will be the margin of the lower lid. In the third stage, three months after the original operation, an incision is made transversely between the two rows of lashes through the skin and the tarsus to open the palpebral fissure.

On the basis of the two cases in which I have applied this admirable and most practical procedure to the upper eyelid, I am convinced that results nearly or just as good may be obtained on this lid. Practically no modification of technique appears to be necessary. As Wheeler has pointed out, it is sometimes surprising

how well the skin of the upper lid will stretch to cover a desired surface. Undermining this skin and bringing it down does not produce distortion of the tissue in the region of the brow. While the tarsus is a structure less fully developed and less important functionally in the lower lid than in the upper, the tarsus of the lower eyelid appears adequate to replace the lost tarsus of the upper eyelid, and in one of these cases the palpebral fold obtained was particularly satisfying. In this same case because of rather advanced age of the patient a free transplantation of hair-bearing skin was not attempted; this may have been undue caution, but since the lashes of the other eye were not long the cosmetic result was satisfying to the patient and the surgeon.

Since the major portion of the lashes point temporally it is well to use the brow of the same eye rather than that of the other eye when reconstructing the upper lid.

Applying Hughes's procedure to the upper eyelid it is possible to reconstruct this tissue so that adequate and mobile covering of the globe is attained. In both of these cases the palpebral fissure was closed in the position of sleep. Furthermore, if the levator is injured it appears possible to reattach the levator in the first stage of this procedure. In the traumatic case mentioned here that portion of the levator tendon attaching to the skin<sup>4</sup> was sutured to tarsus adjoined from the lower lid.

#### CASE REPORTS

CASE 1. Mr. A. T. P., aged 73 years, had a carcinoma of the right upper lid. He was first examined by me on December 17, 1942, and operated upon at the request of Dr. H. W. Cowper. Two years previously the patient had noticed a swollen mass in his right upper eyelid. Carcinoma had been immediately suspected, and an extensive series of X-ray applications was

carried out. At first the mass had become smaller, but recently, in spite of continued use of the X ray, the mass was seen to be growing again. In the fall of 1942, electrodesiccation had been applied to an excrescence on the tarsal surface of the lid (fig. 1).

General physical examination, Wassermann test, and local examination disclosed



Fig. 1 (Hague). Basal-cell carcinoma of right upper lid, December 17, 1942. Case 1.

no relevant disease except for an indurated mass, approximately 9 by 7 mm. in size, involving the lid margin in the right upper lid. The mass was not adherent; it did not extend to underlying bone. The skin, tarsus, and conjunctiva appeared to be involved. At the lid margin there were telangiectatic vessels. The tarsal conjunctiva was somewhat injected, but now quite flat, where electrodesiccation had been employed. The mobility of the eyelid was not appreciably interfered with, but it appeared likely that a malignant tumor, not adequately responding to the X ray, was present.

#### Treatment

First Stage: On December 28, 1942, the patient was put under general anesthesia, and the major portion



of the right upper lid was excised. The segment excised included all of the layers in the region of the entire tarsus and extended somewhat above and nasal to the tarsus, including the upper punctum. The lower lid was split into two transverse layers; the outer layer consisted of skin and orbicularis, the inner layer of tarsus and conjunctiva. In the upper lid the skin above the line of extirpation was undermined. The margin was trimmed from the

postoperative day. Operative reaction subsided rapidly. The functional and cosmetic result satisfied patient and surgeon. When last seen, on April 19, 1944, the patient was doing well. There was no evidence of any recurrence (fig. 2).

CASE 2. Mrs. O. M. B., aged 22 years, suffered traumatic loss of the right upper lid.

On the morning of September 6, 1943,



Fig. 2 (Hague). Right upper lid after excision and reconstruction, eye looking up, straight ahead, and with lids closed, April 18, 1944. Case 1.

inner layer of the lower lid, which was brought up and sutured to the conjunctiva of the upper lid in the region of the fornix, with running silk sutures. The skin of the lower lid was sutured to the lower third of the tarsus, and the skin of the upper lid, after slight undermining, was sutured to the upper two thirds, each with three mattress black-silk sutures. The lid margins were sutured together with interrupted sutures and a pressure dressing was applied. The sutures were all removed on the fifth postoperative day.

Microscopic examination of the excised segment of lid revealed a basal-cell carcinoma.

Second Stage: On July 9, 1943, novocaine infiltration anesthesia was induced and an incision was made separating the upper from the joined lower lid. The skin margins of each lid were sutured to their respective conjunctivas with 8-0 silk sutures and a light dressing was applied. The sutures were removed on the fifth

during the course of an argument with her brother, the latter excised the entire right upper lid except for approximately the temporal fifth of the eyelid, where the lid margin and lashes were preserved. The knife incision was beveled down from above and extended at least an inch into the orbit above the eyeball. The knife appeared to have entered above the palpebral fold, which was absent (fig. 3A). The skin and soft tissues in this region hung down and were not appreciably elevated when the patient looked up. One hour later the police brought in the excised eyelid. At this time the excised tissue, representing the entire thickness of the lid and including all but the temporally situated lashes, was elliptical, with greatest diameters of 13 by 31 mm. The eyeball and recti-muscles were not injured.

#### *Treatment*

First Stage: On the same day, after minimal debridement, novocaine block

anesthesia was induced and repair was carried out as in case 1, except that, in addition, what was believed to be the attachment of the levator to the skin of the upper lid, was grasped with forceps and attached, with two 4-0 chromic catgut sutures, to the lower portion of the external surface of that part of the tarsus from the lower lid now reserved for the upper lid.

hairs of the patient's brow were naturally unusually sparse and short, and in order to increase the lashes in number at least, another similar graft was implanted on November 10, 1943.

Third Stage: On March 28, 1944, the lids were separated surgically, as in case 1. The skin and conjunctiva of the lower lid only were approximated with 8-0 silk sutures, which were removed on the



Fig. 3 (Hague). A, case 2, September 6, 1943. Right upper lid has been excised with a knife. There is pseudoptosis of severed levator and surrounding tissue. The photograph was made under emergency conditions. B and C, the results of lid reconstruction as of July 17, 1944.

Second Stage: Under novocaine infiltration anesthesia an incision was made in the skin of the upper lid near and parallel to the lid margin, where it was joined to the lower lid, and a strip of hair-bearing skin about 20 mm. long and 2 mm. wide was excised from the left eyebrow and transplanted into the first incision. Close approximation of the margins of the transplant to the surrounding skin was secured with 8-0 silk sutures. The wound in the brow was closed with interrupted 4-0 silk sutures. A pressure dressing was applied to the region of the right eye. The

fifth postoperative day. Healing was uneventful, and when the patient was seen last, on July 17, 1944, the result was satisfying to the patient and acceptable to the surgeon (fig. 3 B, C). The eyeball was adequately covered by the lid in the position of sleep, when the palpebral fissure would be either completely closed, or measure as much as 2 mm. at its widest point. If the hairs in the hair-bearing graft had been longer it is deemed that the result would have been completely satisfactory.

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## ORTHOPTIC FICTIONS AND MISCONCEPTIONS\*

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The subject of orthoptic misconceptions and fictions affords wide scope and a valuable opportunity for brief presentation of the many problems confronting the ophthalmologist and the orthoptic technician in the treatment of squint.

One of the misconceptions that has existed throughout the ophthalmologic world for the past 30 or 40 years is that vision in an eye affected with amblyopia ex anopsia cannot be improved after the sixth or seventh year of life. Worth<sup>1</sup> states that after the sixth year an amblyopia due to disuse can no longer be improved. This has not been our experience. In both hospital and private practice we have been able to improve vision by means of total occlusion of the good eye during all waking hours in most young children, many adolescents, and in a few adults. Treatment that consists of wearing an ill-fitting rubber or plaster occluder for only several hours daily is of no avail. The occluder must be kept on all day long. Occlusion by means of Scotch tape, Chavasse glass, or by any other means of clouding the lens before the good eye is practical in some cases for the adolescent but is impractical for the child. It can never be as expedient as total occlusion with adhesive tape, mole skin, or any pad that excludes all light and prevents the patient from using the good eye. It is not always possible, practical, nor desirable to occlude the eye of an adolescent or adult patient because of economic or psychologic reasons. However, if the patient de-

sires to better his vision because of some visual standard that is required of him for some specific endeavor, such as entering the Air Corps or the Military or Naval Academy, the psychologic effect of the occlusion is generally nil. Such a boy does not care what others think when they see him wearing the occlusion; his comrades are informed of its purpose, and as the vision begins to improve, his enthusiasm spurs him on to further coöperation. We have seen a number of adolescent girls who have also been anxious to improve their vision and thus were quite willing to wear the occluder. These young people were never forced to wear it; they were asked if they would be willing to try it and they consented. If coöperation waned and they confessed that they were embarrassed about it or it was too much trouble, occlusion was stopped. We feel that the bad psychologic effect is often worse than the amblyopia. To state that vision cannot be improved after the child has reached the age of six or seven years, is to admit never having occluded the patient properly and for sufficient length of time.

There is so much that we do not understand about amblyopia ex anopsia. Some patients with vision of less than 20/200 will improve at least one line a month and sometimes more. Others with vision of 20/50 to begin with will take six months to attain 20/30 and will not improve beyond this point. The vision in some eyes improves very slowly, as seen sometimes in cases wherein there has been an amblyopia during the entire life of the patient. A cataract begins to form in the better eye and as the crystalline lens becomes opaque the vision in the amblyopic eye begins to improve slowly. No one can

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say with certainty that this case of amblyopia will improve and that case will not. There is only one way of finding out and that is by initiating occlusion in young children whenever possible and in as many older boys and girls as are willing to try because they need to have better vision for some educational or vocational enterprise. It is necessary, indeed, to use good judgement and sound common sense in selecting cases for occlusion and to realize that one is dealing with a human being and not just a pair of eyes. Each case should be considered individually, otherwise much harm may be done to the patient psychologically.

Many cases of amblyopia ex anopsia have developed because the pediatrician and the general practitioner have not been sufficiently informed by the ophthalmologist of the complexities of squint. When the mother informs the doctor that she has thought her baby's eyes were crossed at times, she has been advised to "wait and see." As Dr. Hardy<sup>2</sup> so aptly states "this generally means wait and do *not* see." By the time the child is brought to the ophthalmologist he may have a high degree of amblyopia and suppression, inasmuch as the foveal fixation of a young child can be lost very rapidly indeed.

No matter how young the child, he should be brought to the ophthalmologist for careful study and preventive treatment; treatment directed toward prevention of amblyopia and anomalous correspondence and correction of the refractive error if it be necessary. Often this "wait and see" injunction brings needless worry and anxiety to parents who are greatly upset because of their baby's crossed eye, when in reality he may have only an epicanthus or other abnormality creating the optical illusion of squint. If he had been brought to the ophthalmologist their fears would have been at once relieved when they found that squint did not exist.

However, we have seen cases of epicanthus combined with an intermittent accommodative convergent squint. When the baby was in the office only the epicanthus was noted, inasmuch as the child would not use his accommodation and therefore did not squint. It is sometimes very difficult to make an infant accommodate, but every effort should be made to do so or the squint may be overlooked. We therefore feel it is of paramount importance to observe monthly all cases of epicanthus until it can be very definitely decided that there is or is not a squint. It is very easy to assume that because a child has a marked epicanthus he has no squint.

This waiting may preclude a functional cure. During these years amblyopia and anomalous correspondence may have become fixed, thereby prolonging the treatment many months and sometimes a year; in some cases resulting in a cosmetic cure only. In these days when binocular single vision is a necessity in so many fields of endeavor this is a serious handicap.

Frequently mothers tell us that they have been advised by the family physician to wait "until the child is four or five years of age because otherwise he would be too young to be examined." This misconception of the steps necessary to treat a squint and of the complications that can ensue in a case that has been neglected is very unfortunate. Eyes of infants can be occluded to prevent amblyopia before they are mature enough to give any subjective visual findings. It is also possible with patience and ingenuity to measure the amount of the squint with the prism and cover test, examine the rotations that are of such great importance, secure an objective reading on the major amblyoscope, test the near point of convergence and estimate the refractive error under atropine in children as young as 1½ to 2 years of age. It may take several visits, but rarely do we find that these little tots will

not coöperate. Most of them are highly amused with the procedure. We examine them quietly and slowly, take the time to play with them and gain their confidence and permit them to hold the paddle and the plastic prisms used for the cover test, so they will not be alarmed. As the plastic prisms will not break we have found them to be invaluable in examining timid children. After an average of five or six visits it is usually possible to come to a conclusion as to whether one is dealing with a mechanical, accommodative, or parietic strabismus, and whether it should be treated orthoptically, surgically, or both. If a vertical deviation exists, it may take many months before an accurate diagnosis of the type of motor disturbance can be made in very young children. As most ophthalmologists now believe that surgery can be performed as early as in the child's third year, it is necessary that the diagnosis be made as early as possible, so that if mechanical or parietic factors are present, operation can be performed early, thus giving the little patient a chance to attain and stimulate fusion. The earlier the eyes are straightened the greater the chances that the sensorial apparatus will be stimulated to attain a normal fusion power and the less likelihood there will be of amblyopia and anomalous correspondence. With intelligent children, orthoptic training can be instituted at the age of four years. In this way there is an opportunity of curing the squint before the child starts to school, which is of extreme importance for his future.

Another fiction in orthoptics is that "alternating squints cannot be taught to fuse." If a major amblyoscope is used and the image set before the macula of each eye at the angle of squint, fusion can be obtained as long as the fusion sense in the cortex is present. Cases wherein the fusion sense appears to be absent are in the mi-

nority. We believe that the misconception has probably arisen from the fact that patients with alternating squint were tested on stereoscopes, the Worth amblyoscope, the Rotoscope, and other instruments so mechanically constructed that the images could not be placed before the maculas. A stereoscope can be used for a convergent or divergent squint of not more than 20 to 25 diopters. Prisms can be added, but if of high degree produce distortion of the pictures. If the child has an alternating convergent squint of 70 diopters, he will use first one eye and then the other when placed before a stereoscope, and no attempt will be made to use the two eyes together with the images falling on the maculas. Even if the squint is only 20 diopters he may not stop alternating as he looks into the stereoscope, as there is no stimulus strong enough to break up the habit of alternation. If on the other hand the major amblyoscope is used and the images are set before the maculas at the angle of squint, the patient cannot get rid of the images which are being constantly projected on his maculas, except by suppression. With oscillation of the images peripheral fusion will begin to be established, and later on in the treatment when the suppression has been overcome, foveal fusion will occur. In cases of alternating squint that have been present since birth, fusion may never be attained, but this group is small. In the definitely larger group wherein the squint has appeared in the first to the third year of life, at least 50 percent have anomalous correspondence. This fact alone proves that the fusion sense in the brain is active or there would never have been any desire nor attempt to secure binocular single vision, no matter how poor. An alternator who has no sense of fusion *never* makes any attempt to obtain two-eyed vision, even by anomalous correspondence. If the

fusion sense in the brain is entirely inactive, anomalous correspondence will never be manifest, for this is a binocular act and where no fusion sense exists monocular vision only will result.

Anomalous correspondence in an alternating divergent squint is rare; in convergent squint it is quite common in cases due to a mechanical or structural anomaly because the fusion sense in the brain cannot function properly. Therefore the brain employs the next best thing, which is using the macula of one eye and an eccentric area in the other. As most of the alternating convergent squints fall into this class, they are therefore no more difficult to treat than are cases of unilateral squint.

Here may be emphasized another misconception regarding anomalous correspondence; namely, that it cannot exist in a patient who has 20/15 vision in each eye. This belief is probably based upon the assumption that because the vision is acute in each eye, the patient would have no desire to use an eccentric point in one eye, for this would give him vision that is less acute than macular vision. This is not true for the reasons just explained under alternating squint. A squint in which there is equal and good vision in each eye is obviously an alternating squint and it seems to be the common experience of the clinics in the United States and England that there is a high incidence of anomalous correspondence in alternating squint.

Until she gains experience, the orthoptic technician is often working under the misconception that "a shift of the eyes when the light in the major amblyoscope is flashed, indicates that anomalous correspondence exists." This is a grave error which will retard the successful treatment of the squint case very much. True, when anomalous correspondence does exist there is *always* a shift of the

two eyes, as each eye seeks to receive the image on the macula, but there can also be a shift for other reasons; namely, (1) varying accommodative factor; (2) the breaking up of fusion. The reflex from the light in the major amblyoscope however will never be eccentric in one eye unless there is anomalous correspondence. If the shift is due to varying accommodation or the breaking up of fusion, and not to anomalous correspondence, the light reflex will always coincide with the angle gamma, if present. This constitutes the differential diagnosis. When a patient with high hyperopia who has an accommodative squint sits before the major amblyoscope *uncorrected*, there can be a shift of as high as 50 diopters or more; as he relaxes his accommodation he may fuse the picture with *blurred images* at a setting of only 20 diopters, but if he is asked to describe some minute detail in a picture that is small enough to make him accommodate *fully*, the angle may immediately increase, perhaps to 50 diopters again. Having seen the object in which he was interested he may now relax his accommodation sufficiently to fuse gross charts at orthophoria with blurred images. However, it will be noted that the position of his corneal reflexes is the same at all three angles and that the maculas are being used. In cases with such a high shift one is not so easily misled, but in cases where the shift is approximately 10 diopters keen observation is necessary. If the irides are very dark it sometimes takes several visits before the orthoptic technician is completely satisfied as to the type of correspondence. The maximum angle of squint may be only 25 diopters when the eye is fully accommodating, with relaxed accommodation approximately 15 diopters, and it may be difficult to decide whether the corneal reflexes are in the same position at the two settings because

the iris and the pupil are almost of the same color. In these doubtful cases we always make the afterimage test described by Bielschowsky<sup>3</sup> as well as the major-amblyoscope test. The type of diplopia, whether homonymous or crossed, is tested with red and green spectacles, and the diplopia corrected by as much prism base out or in as is necessary to fuse the two images. This test is a helpful diagnostic aid *when it can be carried out*. Suppression and alternation will often prevent a satisfactory conclusion and in such cases it is worthless and may be misleading. If the correspondence is normal in a convergent squinter, for example, the homonymous diplopia at 6 meters will usually take approximately as much prism, base out, to correct as the amount obtained on the major-amblyoscope reading; if the correspondence is anomalous, the diplopia can still be homonymous instead of crossed, but the amount of base-out prism may closely simulate the abnormal angle on the major amblyoscope. Three tests are therefore made: the major amblyoscope, the afterimage, and the diplopia test. It is quite possible to find normal correspondence by one test and anomalous correspondence by another. The correspondence may vary with such factors as whether the afterimage test is made for 6 meters or 1 meter, and whether in a light or a dark room. The diplopia test may give normal correspondence for distance and abnormal for near. These are the patients who use both types of correspondence. It is advisable to study the cases carefully as soon as a shift of the eyes is observed and to remember that the variations in the motor anomalies of the eyes are many and that we cannot be bound by rigid rules.

Lancaster<sup>4</sup> states that "many ophthalmologists still cling to the conception that disturbances of motility are due fundamentally to 'muscle trouble,' some muscle

is weak or some muscle is too strong. Inevitably they think of the orthoptist's work as trying to strengthen some weak muscle." As Dr. Lancaster pointed out this is a misconception. Orthoptic training stimulates the sensorial apparatus in the cortex and exercises are not given to stimulate "the muscles." Correct habits and skills are taught. Anomalous correspondence, a bad habit, is corrected by establishing good habits of binocular single vision through reëducation. Fusion is stimulated and a strong amplitude of fusion sought. Proper relationship between accommodation and convergence is taught. All this is cerebral and will not "stretch" muscles nor make one muscle weaker or stronger. The attainment of strong fusion and binocular single vision will serve as a stimulus to keep the eyes straight, if an anatomic or mechanical factor or the faulty position of rest does not make this impossible. Eyes will remain straight following orthoptic training in purely accommodative squint, for example, because we teach the brain to make it disagreeable for the patient to turn the eye in. We teach the brain to overcome suppression, and hence diplopia will be manifest if the eye deviates. After a while the bad habit of turning the eye in or out disappears because the good habit of binocular single vision is so much more satisfactory and comfortable for the patient. We have simply established a new habit pattern.

On numerous occasions it has been said "if a squinter is a hyperope he has to wear his glasses anyway, so why bother with orthoptic training?" The orthoptic technicians in Washington, D.C., feel this to be a misconception. As Davis<sup>5</sup> stated: "To be content with this treatment, however, is a tragedy since it condemns the child for life to the wearing of strong glasses continuously. It is symptomatic treatment only." By dissociating the con-

vergence from the accommodation it is possible to give *intelligent* patients with purely accommodative squint and hyperopia of not more than 4 diopters and little or no astigmatism, clear vision without glasses. Hence, we feel that orthoptic training is of the utmost value because the patient can be taught to keep his eyes straight without glasses and without converging for distance and in many cases for near.

Another misconception is that the treatment of squint is often carried out according to the degree of the deviation and not of the type of squint. The amount of the angle of squint is of secondary importance as compared with obtaining a differential diagnosis of what kind of squint with which one is dealing. Not until one knows what is causing the squint can it be treated intelligently. Burian<sup>6</sup> states: "the three factors causing the appearance of a periodic or manifest strabismus are: faulty mechanical conditions, abnormal innervational conditions and a lack of fusion." Bielschowsky<sup>7</sup> also classifies squint in this manner. We have found this classification to be the most satisfactory and expedient guide in the diagnosis of squint. If one considers the type of squint, it is obvious that one will also consider the cause. If merely the degree or amount of squint is

considered, the cause is still unknown, inasmuch as a squint can be of any degree and still be caused either by a mechanical or functional defect or a combination of both. Knowing the amount of the squint does not solve the problem of what procedure to pursue in its treatment; it tells nothing as to whether the patient has an abnormal position of rest of the eyes due to mechanical or structural conditions, whether there is a refractive error that disturbs the relationship between accommodation and convergence, which is functional, whether the squint is associated with fusion weakness, or whether it is present only under stress and undue excitement and is a neurogenic manifestation. The amount of the squint does not indicate the methods to be used to secure fusion and stable binocular single vision as rapidly as possible, nor does it tell the ophthalmologist whether the case is one for surgery and, if so, when and what surgical methods should be attempted.

I wish to extend my grateful thanks to Dr. LeGrand H. Hardy and to my late Chief, Dr. William Thornwall Davis, for helping me in listing some of the misconceptions and fictions in orthoptic training, and for the valuable counsel and stimulation they have given me.

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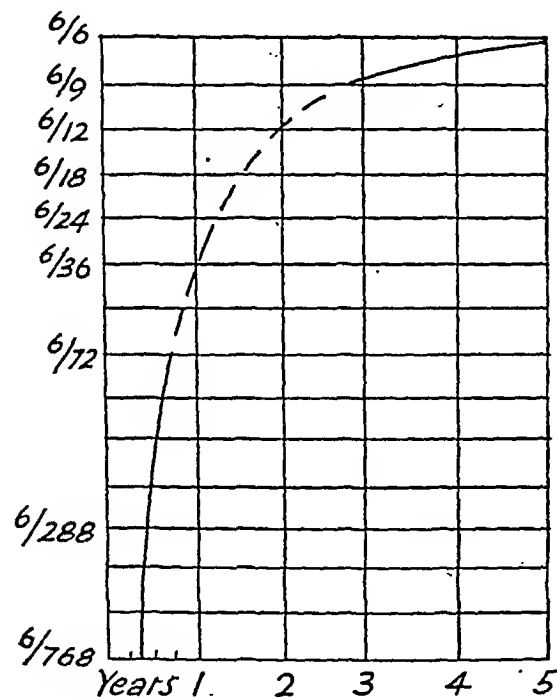
## DISCUSSION

DR. WALTER B. LANCASTER: Miss Wells is to be complimented for the excellence of her paper, for the choice of topics, and her treatment of them which is marked by sound understanding and mature experience.

Can anything be said to make the prognosis in amblyopia ex anopsia less indefinite? While I agree that in the final analy-

will be 6/5, vision O.S. perhaps 6/60, which is what it was a year before the onset of strabismus. In a given case it may, of course, be less or more than this. Now when occlusion is begun, the left eye, starting at 6/60 or thereabouts, has the task of recovering the vision it once had. This is usually not a difficult task and progress is rapid up to 6/12, but after that it will be slower because he is conquering new territory.

Take another case where strabismus began at six months of age, when vision was around 6/300. Occlusion begun some years later would have the task not of recovering vision once attained but of developing vision which the child never had. Obviously, this is a much more difficult task. However, the vision in a normal child is developing up to five or six years of age before reaching 6/6; in other words, it is still in a state of flux, the tide is coming in; hence if the task is started before arriving at the fixity of vision which is reached soon after six years of age, there is still a good prospect of improving vision but not at the rapid rate seen in the first case. During this period, there is a state of flux, the tide is coming in, the individual is growing, acquiring skill, learning to use his faculties, is more receptive.



The development of visual acuity (after Chavasse in last edition of Worth's "Squint").

sis only a determined trial can decide I believe there are clues of value (chart). This diagram shows the progress of visual acuity as the child grows from birth to five years of age. Suppose a child progresses normally until two years of age. His visual acuity will be approximately 6/12. If he begins now to squint with the left eye there will be suppression of the left eye and, lacking daily exercise, the vision will cease to improve. Instead it will begin to deteriorate. If he is examined six years later at eight years of age, vision O.D.

Perhaps the same principle applies to the development of fusion. If one starts to train a patient 20 years old who has had alternating convergent strabismus since infancy, he is beginning long after the period when the normal child was going through the process of learning to use the two eyes in binocular vision. He has spent this time in learning to see in another very different way; namely, suppressing the eye he did not use to fixate with. This habit or conditioned reflex is now well established. It is not fair to say

that he has no fusion center, no fusion faculty. It has never been made use of and it is no easy task to arouse it. It may indeed have atrophied beyond repair.

It seems to me that this conception of the normal growth and development of the child helps in understanding the problems. It certainly gives strong reason for an early start in dealing with any squint. Moreover, the same principle applies to the progress which is often so much more rapid when a child begins to read and is now learning new ways of using his eyes—beginning for the first time to concentrate and hold fixation on small letters. Treatment for suppression is much more effective at this stage. It is a general principle of pedagogy that you can teach a child more easily and rapidly those subjects which are adapted to the mental stage of the child—mathematics at one age, language at another, social behavior, good manners at another.

I was pleased that Miss Wells endorsed so definitely my plea for abandoning the old notion of weak muscles. I still find that most patients who have been seen by the ophthalmologist tell me they have "muscle trouble," a "lazy muscle," or the like. I am sure progress is being made. The American Board used to have one of its examinations devoted to "Muscles"; now it is "Motility."

There is another matter that is worrying me because I am not in agreement with a large number of ophthalmologists and orthoptists. The statement is made that orthoptics involves diagnosis and therapeutics and of these diagnosis is the more important. And it is stated that it is of paramount importance that the orthoptist should measure the deviation in the six cardinal directions (I wonder why not nine). In my opinion diagnosis is the function of the ophthalmologist and not, or only in small degree, that of the orthop-

tist. By small degree I mean such matters as deviation in the primary position, amplitudes of fusion, degree of binocular vision, suppression, anomalous correspondence, and the like. Whether a patient's deviation is due to paralysis and if so whether the etiology is syphilis, encephalitis, tumor, trauma, or what not is the ophthalmologist's concern not by any fair definition the orthoptic technician's job. The internist employs a technician to do his laboratory work on urine, blood, and other testing. If she finds an eosinophilia, it is not her province to decide whether it is due to an allergy, a trichinosis, or what not. If an ophthalmologist has a patient with recent diplopia, it is his job to discover that it is due to a paresis of the superior oblique and to decide whether its cause is a peripheral or a nuclear lesion and toxic or circulatory or what not. If he has a case of exophoria he can submit it to the orthoptist for her opinion as to whether she can help it and she may have to decide as to insufficient convergence or excessive divergence in planning her treatment. She will probably and properly leave it to the ophthalmologist to decide about the glasses to be prescribed for any refractive error that may be present, and the use of prisms for constant wear.

I wish someone would cite two or three cases where measuring the deviation in the six cardinal directions had a plain bearing on the treatment given by the orthoptist—on the treatment given by the ophthalmologist it has of course an important bearing in some few cases, not, I claim, on the orthoptist's work.

That an ophthalmologist wishes someone to make measurements of refractive errors such as astigmatism or of disturbances of motility such as are found in motor paralysis, or even to examine and diagnose fundus conditions I can readily understand, but these are functions of an

ophthalmologist which he delegates to an assistant. If the same person does an ophthalmologist's perimetry, refraction, and orthoptics, that person is doing things not fairly to be included under the term orthoptics. I have no objection whatever to her doing these things, but do not, I

beg of you, label them orthoptics or assert that no one is a good orthoptist who cannot or does not do these things, and do not include them in the requirements for certification by the Council.

*520 Commonwealth Avenue,  
Boston, Massachusetts.*

## HEREDITY AS A FACTOR IN SQUINT\*

LILLIAN POWELL DARR  
*Chicago*

The question as to whether heredity is a factor in squint has been debated for a long time, and it is apparent that many prominent ophthalmologists differ as to the degree of responsibility with which heredity may be charged in respect to squint.

Worth states that in 1,323 cases of squint in which he was able to get reasonably reliable information, hereditary influence was a marked feature, and furthermore there was found to be a history of squint in parent, grandmother, brother, or sister of the patient in no less than 711 instances (51.74 percent of cases).

From personal observation and from the examination of 300 cases taken at random, I discovered 153 patients, who had one or more relatives afflicted with squint (or approximately 50 percent). This percentage is almost identical with that determined by Worth in his investigation.

In the cases which I studied, a history of squint was revealed in 47 mothers, 15 fathers, 19 cousins, 6 grandmothers, 2 grandfathers, 5 uncles, and 2 aunts; the rest was in brothers or sisters of the patients concerned.

It seems reasonable to assume that if

we find this number admittedly afflicted with squint, there were probably many more unrecorded cases in relatives.

Parents are frequently reluctant to admit that squint existed in any of the relatives of the patient, and in many instances appear to be unaware of the existence of squint in their child. It is not at all unusual to find that this condition has been neglected for so long a time that it is too late for any treatment other than cosmetic surgery.

Various theories as to the cause of squint have been and are being advanced; for instance, Worth stated that squint is caused from a defective fusion faculty. Other writers attribute this condition to the muscles! Hypermetropia has been advanced as the cause. Octave Doen defines strabismus as a "vice" in the development of the ocular-vision apparatus.

These various opinions may all be true to a varying degree, although it is known that a majority of people are born hypermetropic and yet do not squint. Good motility is frequently found in all fields and yet this condition obtains.

When I find squinters in children under three years of age, with no evidence of their having sustained an eye injury, I suspect hereditary influence and give very close attention to these cases, for unquestionably it is here that the greatest

\* Read before the Symposium on Orthoptics, Academy of Ophthalmology and Otolaryngology, at Chicago, October, 1944.

difficulty in effecting a cure is encountered, and usually either early surgery or longer fusion training is required or both.

When squint develops in children over three years old, their response to orthoptic training may be expected to be much more satisfactory, but the rapidity with which a cure can be obtained may naturally depend on prompt discovery, correct diagnosis, accurate refraction, and the immediate starting of treatments.

I have observed that children who are squinters frequently suffer from constitutional disorders other than ocular difficulties: Some are highly nervous; others suffer from impediments of speech; others, again, may be dull and listless. These children should have special medical care.

It has been my experience that there are many more girls with strabismus than boys. This may be attributed partially to the fact that mothers are quicker to detect squint in girls, but I believe the dominant factor determining this large percentage of girl squinters may be found in the difference in nervous stability.

One or both parents of a nervous child

who squints will usually be of the nervous type. This nervous child may have third-grade fusion, his motility may be good, he may have had an accurate refraction, and he may hold his eyes parallel most of the time, but let him become tired or frightened and he squints. Children unquestionably resemble their parents in physical appearance, and their nervous reactions are similar as well.

When so many cases of squint are discovered in children of nervous parents, it seems quite logical to assume that heredity may be charged with transmitting at least a disposition to strabismus. This particular phase of hereditary influence may manifest itself in irregularities of refraction, in minor cerebral deficiencies, and in particular, in an antipathy to single vision, such as is frequently encountered in highly ametropic families.

If this assumption is reasonable, it follows that in families where squint has been known to occur, special attention should be paid to the ocular movements and to the immediate correction of any such abnormality as may appear.

*58 East Washington Street.*

# NOTES, CASES, INSTRUMENTS

## COMPARATIVE FLACCIDNESS AND RESILIENCE OF CORNEA AND SCLERA

A. C. HILDING, M.D.

Duluth, Minnesota

The late Edward Jackson of Denver suggested to the writer a few years ago that a study of corneal resilience be made. He was apparently of the opinion that the resilience of the cornea was sufficient to cause it to return unaided to its normal shape and position, for instance, after cataract incision. The writer made some simple tests as suggested, but found that flaccidness characterized the cornea rather than resilience.

### EXPERIMENTAL

*Material.* Freshly enucleated ox eyes

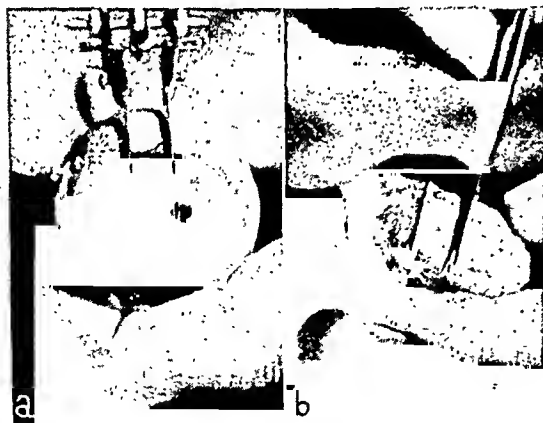


Fig. 1 (Hilding). Method of cutting the rings from the wall of the eye. The rings were first outlined by means of a double Castroviejo knife in such a manner as to include both anterior and posterior poles (a). The incisions were finished with a scissors (b).

and freshly enucleated human eyes were used in the tests.

*Technique.* Three different types of preparations were made; namely, (a) rectangular strips containing equal lengths of both cornea and sclera, (b) rings or

hoops taken all the way around the globe in a sagittal direction, including the widest diameter of the cornea, and (c) the entire cornea isolated from the rest of the eye.

The strips and rings were outlined with a Castroviejo double knife, by cutting part way through the wall, and were then removed completely by means of a scissors (fig. 1 a, b). The strips were so shaped that the limbus divided each across the middle; that is, the scleral and corneal portions were equal in length.

The rings included the entire circumference of the eye and both anterior and posterior poles. Thus the corneal portion was the longest that could be obtained. The isolated cornea was removed by a circumcorneal incision at the limbus. In some instances a small ring of sclera was left attached to the periphery of the cornea.

*Tests.* All of the tests were made on de-



Fig. 2 (Hilding). Rectangular strip cut from the wall of an ox eye in such a way as to include equal lengths of sclera and cornea. The corneal portion hung limply when supported at the limbus whether the concave side was up (a) or down (b).

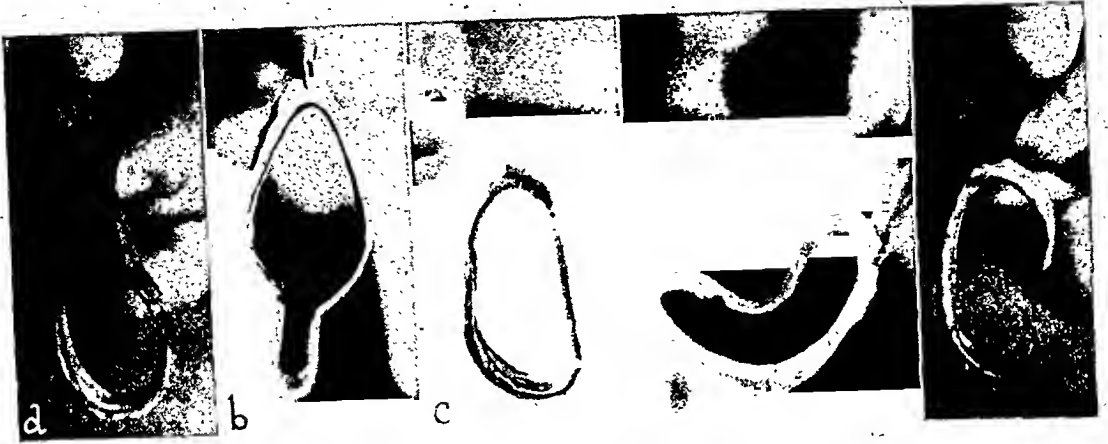


Fig. 3 (Hilding). The flaccid character of the cornea is demonstrated in these photographs of a ring cut from an ox eye and supported at: the anterior pole (a), posterior pole (b), equator on one side (c), equator on both sides (d), and at a point midway between the posterior pole and the equator on one side (e).

formation by force of gravity. The strips were tested by grasping them at the limbus with a small thumb forceps in such a way that the portion held by the forceps was horizontal both longitudinally and transversely. They were tested with the concave side both upward and downward (fig. 2 a, b). The rings were tested by observing the effect of gravity while they were held at different points with a thumb forceps.

The different points at which the rings were grasped were: (a) anterior pole, (b) posterior pole, (c) equator on one side, (d) equator on both sides, (e) a few millimeters posterior to the equator (fig. 3 a, b, c, d, e). The entire cornea was tested by laying it concave side upward upon a metal applicator (fig. 4).

### RESULTS

It can be seen by consulting the illustrations that the cornea had little or no resilience. It is characterized by flaccidness. Its tendency to resume its original position and shape after deformation is limited at best. When the strips were held in a horizontal position, the scleral end sagged somewhat, but exhibited a definite springlike quality. However, the cornea

hung limply like a bit of thick fabric no matter which surface was turned upward. All of the tests on the rings showed the same flaccid quality of the cornea. It is seen best perhaps in figure 3e. The entire excised cornea also draped itself

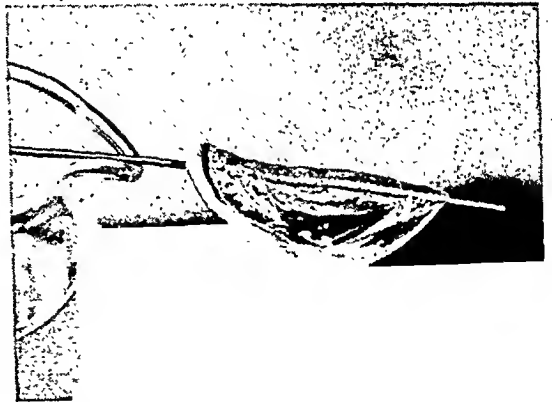


Fig. 4 (Hilding). The entire cornea excised from an ox eye lying with the concave side uppermost. A rim of sclera left on one side gives it a measure of support on that side. Otherwise it hangs limply.

limply over the applicator except for a portion that was given a measure of support by a small strip of sclera (fig. 4).

### CONCLUSION

The cornea of freshly enucleated ox eyes and human eyes is largely lacking in

resilience and is characterized by a flaccid quality.

626 Medical Arts Building.

### THE LIPOTROPIC EFFECT OF CHOLINE IN RETINAL TUBERCULOSIS\*

THEODORE J. DIMITRY, M.D., AND  
R. T. LOMBARDO, M.D.

*New Orleans*

Study of tuberculous skin diseases like that of tuberculous eye disease has been pursued unremittingly throughout the history of medicine; on a scientific basis since 1884. In that year Koch isolated the specific bacillus of tuberculin and gave an impetus to the knowledge of the pathology of this disease.

Lupus vulgaris is a definite tuberculous skin lesion, for the bacilli are readily isolated from the lesions; lupus erythematosus is an inflammatory skin lesion, similar in appearance, and difficult to differentiate from it. The presence of the bacilli decides the diagnosis.

Both of these skin lesions were present in a case of tuberculous perivascularitis of the retina induced by taking a biopsy specimen from a patch of lupus erythematosus. The specimen was negative for tubercle bacilli.

*Case report.* Mrs. X., a robust woman, aged 21 years, had not previously been ill. Several months prior to her admission to the Hospital her refraction had been tested. The error uncovered was small and the fundus normal. No history of tuberculosis could be elicited, nor had the patient associated with tuberculous individuals. The only possible exposure was that contingent upon her duties as waitress in the physician's dining room and as elevator operator at the Nurses Home.

\*From the Department of Ophthalmology, Charity Hospital of Louisiana.

She came to the hospital complaining of a skin lesion on the left side of the nose, at the inner angle of the eye. Treatment was by the usual methods, but since these were ineffectual a biopsy specimen was taken. The location selected for removal of the specimen was very slightly below the angular vessel. No excessive bleeding was noted. The specimen was negative for tubercle bacilli.

Six days later both eyes became involved. Dr. Wilensky, Senior Resident at the Hospital, made the following report of his findings on ophthalmoscopic and slit-lamp examination: L.E. "The entire fundus is markedly hazy. In the macular region, focused with a +6D. lens there is a white, pea-sized patch with some surrounding darker strands of pigment. Following the vessels out toward the periphery are numerous small, white patches adjacent to the vessels but chiefly next to the veins. These perivascular inflammatory patches or exudates seem partially to obscure the lumen of the adjacent area of vessels, giving the impression of localized areas of vasoconstriction. These areas of exudate or perivascularitis are seen more prominently toward the periphery of the fundus below and above. Throughout the fundus of the left eye are multiple small hemorrhages, and in the right eye is a proliferation of retinal tissue into the vitreous.

"Slitlamp examination: No aqueous flare nor precipitates are seen on the lens or corneal endothelium. The entire vitreous is full of floating cells like black stars. The consistence of the vitreous is maintained, however." Dr. Wilensky further stated that the condition closely resembled that described by Duke-Elder under disseminated tuberculous choroiditis. His findings were confirmed by us.

The patient was first given vitamin K in the hope of controlling the ocular hemorrhages, but without effect. Promine

also was administered. It was then that therapy with choline was begun, 5 grains three times daily. Within a period of two weeks the hemorrhages diminished and the tubercles were noted to be fading away. In time they disappeared entirely, as did the hemorrhages in the eye. Recovery was proceeding well, when upon the insistence of the patient, tuberculin was administered. The vitreous became extremely cloudy for the second time but no hemorrhages occurred. However, neither the retinal hemorrhages nor the tubercles have reappeared after a period of nine months. The vitreous changes were not equally affected. The black stars persisted for months. Vision has improved as have, eventually, also the vitreous opacities.

*Discussion.* This account of a metastatic tuberculosis in the eye from a lupus erythematosus is difficult to accept, for lupus may or may not be a tuberculous lesion of the skin. In this case it would appear that a nontuberculous lesion of the skin induced a tuberculous lesion of the eye.

It is known that well-advanced pulmonary phthisis may exist without involving the eye internally or externally and that phthisis often follows upon tuberculous lesions in and about the eye. Duke-Elder<sup>1</sup> states that "tuberculosis of the retina is always secondary in the sense that it is hematogenously derived from lesions elsewhere in the body," and, according to McLeod,<sup>2</sup> lupus erythematosus is not an involvement due to one specific cause, but rather a cutaneous symptom which may be called forth by a variety of causes of a toxic or septicemic character. Benson and Cannon<sup>3</sup> state that 10 out of 12 cases of lupus erythematosus present evidences of

latent or active tuberculosis. Whether the skin lesion in the present case was tuberculous or not, it healed and has remained healed for a year or more. No direct claim is made that choline accomplished this result, but it may have done so.

Retinal perivasculitis, a tuberculosis of the eye, is not considered a rare condition. It is recognized to be the result of a metastasis from a tuberculous lesion at a remote source.<sup>4</sup> Treatment has been unsatisfactory. It is directed to the tuberculous condition, but the bacilli, protected by a fatty capsule, are often difficult to reach. The capsule removed, the bacilli may more readily succumb to the medication. This is a speculative thesis. However, in the case here reported upon, the administration of choline, a lipotropic agent and antihemorrhagic, the tubercles retrogressed and finally disappeared. In our experience choline has had a similar effect in many conditions where there was the appearance of lipoidosis and deposits of cholesterol.

The antihemorrhagic effect of choline has been established in rats fed on a choline-deficient diet; also in human cases of hemorrhages in the eye, although not after choline-free diet. During the period when the choline was taken the patient gained weight and improved generally. At the time of this writing the patient continues to take choline and has unquestionably been benefited.

*Conclusion.* In cases of tubercles in the eye, choline should be given a trial, whether the tubercle be tuberculous or leprosy in character. It has an antihemorrhagic effect in cases of ocular hemorrhage due to tuberculosis.

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- <sup>3</sup> Benson and Cannon. Arch. Derm. Syph., 1931, v. 12, June, pp. 1-35.
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# SOCIETY PROCEEDINGS

EDITED BY DONALD J. LYLE

## LOS ANGELES SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

March 27, 1944

### CONGENITAL CATARACTS IN CHILDREN

DR. ETTA C. JEANCON reported two cases of unusual congenital cataracts, one of which seemed to be quite rare, for she had found no records of similar cases.

The first patient was a two-year-old child, whose first eye had been operated on a year ago; the second a month ago. The child was normal in health, born of sturdy young parents. Reportedly there had been no history of ocular disturbances for two generations at least. The unusual feature was that the usual examination procedures, including dilatation, uncovered no changes other than a congenital cataract in each eye involving the whole lens.

When the usual dissection was performed it was found that there was only an empty capsule. The pupillary area was opened, and no cortex was found. The day after operation there was practically no postoperative reaction; the pupil was clear, the fundus normal as far as could be determined. A +12.00D. sph., the approximate retinoscopic finding, was prescribed and the child was sent back to her home. Eleven months later the parents brought her back for operation on the other eye, which was exactly the same as the first.

The patient was too young to be tested for visual acuity, but since there was no other visual abnormality, it was felt that this child would develop full visual function.

The only significant thing about the

history was that the parents thought the cataract did not look so densely white as the child approached one year old as it had shortly after birth. From this fact it was presumed that this was a congenital morgagnian cataract in which complete absorption occurred. Dr. Jeancon said that Ida Mann states that this type of cataract is caused by lack of development of central fibers, or an early secondary degeneration of these fibers, which have disintegrated and softened, the nucleus sinking to the bottom of the capsule. She said that C. A. Clapp says this type should be operated on by linear extraction and irrigation and that a marked reaction should be expected. Nowhere had she been able to find a record of complete absorption of this degenerated cortex.

Dr. Jeancon said that the other case was not rare but interesting because of the hereditary factor, four generations, at least, of congenital cataracts of the same type. The first case in this family was of a 14-year-old girl on whose first eye she had operated seven years ago. One year later operation on the other eye was performed. This patient had 6/5 vision in each eye and was able to read J1. At that time the patient's mother and brother were found to have zonular cataracts in both eyes. It was learned that the grandmother and great-grandmother had the same type of cataracts. In order to see they covered their eyes with the palms of their hands, leaving a little peep-hole (thus allowing the pupil to relax in the dark), and by tilting the head could look over the central opacity. An uncle of the patient on the maternal side also had this type of cataract.

Dr. Jeancon gave a brief review of recent reports, including those of Ida Mann, C. A. Clapp, and the article by Harold Falls of Ann Arbor, in which he reviews 131 cases of developmental cataracts which disclosed a few outstanding factors. Very little can be said regarding etiology except that congenital cataracts occur as aberrations of development, due to some toxic or other disturbance of maternal blood chemistry. The prenatal time at which this disturbance occurs is the only fact that can be stated definitely. Ida Mann stresses that (1) Defects situated outside the fetal nucleus cannot be congenital; (2) Secondary defects may arise in postnatal life and yet be developmental, since the lens continues to develop throughout life.

The classifications are: (1) complete—in which the whole lens is involved; (2) incomplete—classified as zonular, pyramidal, discoid, punctate, coraliform, floriform, congenital-morgagnian, and so forth.

Surgical treatment is advocated as follows: (1) If the cataract is complete, there is no other alternative except surgery; (2) If bilateral, operation should be performed on one eye at six months of age, the other after 1 to 2 years; (3) If incomplete and the visual acuity is 6/15 or better, surgery is not indicated; (4) If the patient is able to get around but the vision is less than 6/15, surgery should be postponed for several years.

It is generally agreed that discission is the easiest and simplest method of surgery. There is less trauma, and if the operation has to be repeated it is still the safest, especially before the third or fourth year. The next method of choice is linear extraction or needling followed by linear extraction. This is especially indicated if there is marked swelling of the cortex with blocking of the angle and

secondary glaucoma, or if the child cannot be kept under sufficient observation to make certain that glaucoma will not develop between periods of examination.

## COLORADO OPHTHALMOLOGICAL SOCIETY

March 18, 1944

DR. WILLIAM M. BANE, *presiding*

### BENIGN ORBITAL NEOPLASM

DR. R. C. RICHARDSON presented B. H., a woman aged 38 years, who was admitted to the out-patient department on September 17, 1942. She was referred because of suspicion of an intraorbital neoplasm. At that time the vision was R.E. 20/20, with and without correction; L.E. 20/200, improved to 20/40 with correction. The tension was 15 mm. Hg (Schiotz) in each eye. The right eye was essentially normal. The left eye exhibited considerable pathologic change in the fundus. Wavy striations of irregularly distributed pigment, which were somewhat elevated, were seen extending from the nerve head through the macula temporally. Some proptosis was present. Visual-field examination elicited a relative central scotoma when a 0.75 mm. object was used.

Neurologic examination was negative. X-ray examination revealed nothing of significance. Laboratory studies were negative.

The patient was observed regularly and treated conservatively. She received considerable X-ray therapy. The eye subjectively improved; there were less pain and less visual disturbance. The vision L.E. was 20/70; improved to 20/30 with glasses. The proptosis did not increase. The tension was normal. There was no change in the appearance of the fundus.

# RESTRICTED VISUAL FIELDS—QUESTION- ABLE HYSTERIA

DR. R. C. RICHARDSON presented L. F., a woman aged 47 years, who was seen for the first time on March 7, 1934. A diagnosis of compound hyperopic astigmatism was made at that time. The fundi were normal. The tension was normal to palpation. Visual-field examination disclosed some peripheral constriction, moderate in amount. The blind spots in both eyes were enlarged. The vision was 20/40, with correction, in both eyes.

The patient was examined again on May 5, 1939. The vision was still 20/40, with correction, in both eyes. The tension was 13 mm. Hg (Schiotz) in both eyes.

On June 23, 1941, the vision was 20/70, with correction, in both eyes. There was probably physiologic central cupping of the disc in each eye.

On December 3, 1943, visual-field examination showed restriction to a small area of central vision. The vision, with correction, was R.E. 20/200; L.E. 20/100. The tension has varied from 22 to 24 mm. in both eyes. General physical examination, including neurologic studies, disclosed nothing pertinent. All laboratory work was negative. The patient was able to orient herself and managed to get about alone.

Walter A. Omhart,  
Secretary.

## NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

April 3, 1944

DR. MILTON L. BERLINER, *presiding*

### BLOOD DYSCRASIAS

DR. NATHAN ROSENTHAL presented a paper on this subject during the instructional hour.

# OCULAR EXPRESSIONS OF BLOOD DYSCRASIAS

DR. SIGMUND A. AGATSTON stated that the ocular expressions of blood dyscrasias are located chiefly in the retina. Retinopathy is caused by changes in blood vessels and capillaries, which, in turn, are caused by variations in the composition of the blood or the presence of some toxic substance in the blood. While in arteriolar disease angiospasm create quantitative reduction of blood, in blood dyscrasias there is a qualitative reduction, producing a similar effect. This is based on homeostatic nutritional disturbance as well as anoxemia resulting in stasis, structural changes in the capillaries, and also increase in permeability.

The various blood dyscrasias were described individually as were also their ophthalmoscopic appearance. Diabetes was included in the descriptions, as the retinal changes are like those of blood dyscrasias with secondary degenerative changes in capillaries and veins.

*Discussion.* Dr. Nathan Rosenthal inquired about the fundus picture in mild and severe anemias.

Dr. Agatston stated that in mild anemia there is not much change in the fundus. In severe anemia, before hemorrhages appear, the arteries are very small, causing hyalinization, and having the appearance of essential hypertension. Later, there is venous thrombosis and the subsequent hemorrhage makes it difficult to recognize the condition of the arteries. Following thrombosis due to any cause there is secondary paling of the arteries as well as narrowing, so that thrombosis of the ordinary vein and artery has the picture of hypertension. Mild cases do not present these changes.

In chronic leukemia the fundus is usually pale and yellow without venous engorgement and hemorrhage, whereas in

acute leukemia there is thrombosis and hemorrhage.

#### NONSURGICAL TREATMENT OF OCULAR NEW GROWTHS

DR. MAURICE LENZ discussed the radium and X-ray therapy of new growths in and about the eye. The use of radiation therapy is based on its inhibitory effect on the growth and reproduction of living cells and the difference of effect in different cells. Cells are more radiosensitive when young than when they are old and have ceased dividing. An example of this is in the prevention of vascularization after keratoplasty; irradiation one day after operation is effective because capillaries have not yet formed, whereas later it will not control possible vascularization. In treating a tumor it should be emphasized that radium and X ray affect only the part exposed to an adequate dose and consequently if even a fraction of a millimeter of the neoplasm is missed the treatment is valueless.

The factors upon which the selection of the type of radiation are based include the nature, depth, and location of the tumor. The conjunctiva is sensitive to irradiation and the cornea less so. Adverse effects upon the lens are more likely to occur in elderly, cachetic, or very young patients, but a dose of 400 to 600 r can reach the lens and not produce cataract. The uveal tract, like blood vessels generally, is not very sensitive except in babies. The retina is insensitive.

*Discussion.* Dr. William Harris believes that radiotherapy in most cases of infection, whether complicating neoplasm or not, offers a great field of usefulness in ophthalmology. The dangers inherent in the use of radiotherapy about the eye can be minimized by proper care and selected fields of entry. In benign conditions the dosage is usually so small that no untoward sequelae follow. The use of

X ray as a diagnostic procedure is of great importance in lymphoblastoma, especially follicular lymphoblastoma which has a high incidence of unilateral exophthalmos. In the presence of this condition a 10-day trial with radiotherapy will usually indicate whether the diagnosis is correct.

#### THE NEOPLASTIC ACTIVITIES OF THE MELANOBLAST

DR. ALGERNON B. REESE stated that a melanoblast is a cell that can produce melanin in its protoplasm. Four types of cells can do this; namely, (1) the chromatophore of the uveal tract and the Mongolian spot, (2) the Schwann cell, (3) the basal layer of the skin and conjunctiva, and (4) the pigment epithelium of the eye. All four of these melanoblasts are encountered in ophthalmology. It is just as incorrect to call a tumor arising from these cells and containing melanin a melanoma as it is to call a tumor containing fibrils a fibroma.

The types of tumors arising from the four types of melanoblasts were described, their characteristics and indicated treatment were given, along with the terminology which will distinguish the one from the other.

(1) The chromatophore. This is found in the uveal tract, the Mongolian spot, and the extrasacral Mongolian spot (blue nevus). The tumor arising from this is the benign and malignant melanoma.

(2) The Schwann cell. The cells are found in relation to the peripheral nerves. The tumors arising from them are the neurofibroma, the nevus, and the neurogenic melanoma of the uvea.

(3) The basal layer of the skin and conjunctiva. The location of these cells may be anywhere over the body, and the type of tumor arising from them is the precancerous melanosis, the malignant melanosis, the papilloma, and the epithelioma.

(4) The pigment epithelium. These cells are found in the eye and the tumor arising from them is an adenoma or carcinoma.

*Discussion.* Dr. Maurice N. Richter found it of particular interest to examine Dr. Reese's classification in the light of present concepts. A study of melanin-containing cells in various parts of the body clearly shows that they are of different types and origins. There is, therefore, a sound basis for the separation of tumors arising from them.

There is difficulty, however, in determining the origin of some of these tumors. The fact that cells are in close anatomic relation to certain structures is not sufficient evidence that they arose from those structures. It would seem that some additional information is needed that our present methods of examination do not supply.

A step in this direction has been made in the study of cells by the tissue-culture method. A number of years ago Smith observed the growth of pigmented cells from the retina and uveal tract *in vitro*, and found the former to grow in sheets, as epithelial cells grow, and the latter individually, as connective-tissue cells grow. He applied this knowledge to pigmented tumors without, however, actually growing these tumors in tissue culture. He said that the only melanoma grown in tissue culture with which he is familiar is a transplantable mouse tumor that grows as individual cells, that do not resemble epithelium.

In the case of pigmented tumors of the cornea and conjunctiva, the derivation as outlined by Dr. Reese is not quite clear. Masson has shown that ordinary nevi and melanomas of the skin are derived from the terminal portions of the sheath of Schwann, and that some may arise from the Merkel-Ranvier cells in the basal layers of the skin, thus giving

the impression of origin from the ordinary basal layer cells. Dermatologists have noted the development of this type of tumor in the so-called "junction-type" nevus, and he wondered whether the cases described by Dr. Reese as "melanosis" may not fall in this category. He asked for further comment by Dr. Reese on the practical aspect of classification, especially as related to prognosis.

Dr. Reese, in closing, said that he realized that he was on equivocal grounds and that his classification represented his immediate feelings which might be altered in the light of further experience. He has seen cases which would not fall sharply into any single group, but this is inherent in any system of classification. Malignant melanoma of the uveal tract and the neurogenic type of melanoma which arises from a nevus have a mortality rate of 50 percent. The cancerous melanosis of the conjunctiva and skin has a mortality rate of over 90 percent.

Leon H. Ehrlich,  
Secretary.

## CHICAGO OPHTHALMOLOGICAL SOCIETY

April 17, 1944

DR. VERNON M. LEECH, *president*

### CLINICAL MEETING

(From the Department of Ophthalmology,  
Northwestern University)

### CONGENITAL COLOBOMA OF THE UPPER LID

DR. DEAN SPEAR presented M. M. R., a child, aged one year, who had a coloboma of the upper lid of the right eye. On examination, a central defect of the upper lid, roughly about 8 by 5 mm., was noted. No other defect of the eyeball or extraocular muscles was noted. On October 2, 1943, the lower lid was split, and a tarso-

conjunctival layer was brought into the defect. A bridge flap of skin was made to produce the upper-lid margin, and a full-thickness graft from the upper lid was placed into the skin defect. Healing was normal. On December 29th, lashes were transplanted from the right brow. In March, 1944, the lid adhesions were severed. The lash transplants had been only partly successful, but a fairly good cosmetic result had been achieved.

#### OCULAR PEMPHIGUS

DR. DEAN SPEAR presented Mr. G. P., who had consulted Dr. Gifford on July 7, 1943, because of gradually failing vision during the past three years. A foreign-body sensation was present in the eye most of the time. Visual acuity was R.E. 1/200; L.E. 20/100. There was much scarring and vascularization of both corneas and shrinkage of the conjunctival sac, with several symblephara particularly in the lower fornix. The Macht test for ocular pemphigus was positive. He had been treated with vitamin A, wheat-germ oil, alkaline buffer solution, and olive-oil drops at night. Visual acuity improved to R.E. 20/200; L.E. 20/40.

#### KERATOCONJUNCTIVITIS SICCA

DR. S. KAMELLIN presented S. P., a woman, aged 52 years, who was seen in February, 1944, complaining of intense itching of the eyes. It was noted that she was a victim of chronic arthritis, which immediately gave a clue to the diagnosis. Visual acuity, corrected, was R.E. 20/20 + 4; L.E. 20/20 + 1. The conjunctiva appeared normal. Slitlamp study revealed many fine staining pinpoint spots and very fine epithelial opacities. The Schirmer test was performed and no wetting of the filter paper was noted at the end of five minutes. Locke's solution with gelatin and a preservative was prescribed. The staining

areas diminished and there was also symptomatic improvement. Closure of the tear ducts may be resorted to in the future.

#### FUNDUS CHANGES IN HODGKIN'S DISEASE

DR. S. KAMELLIN presented D. B., a man, aged 26 years, who was seen for the first time by Dr. Gifford in March, 1943. He was being treated elsewhere for generalized Hodgkin's disease and was experiencing progressive loss of vision. Visual acuity was R.E. 10/200; L.E. 2/300. There was moderate superficial and deep congestion of the vessels, fine precipitates and cells in the anterior chamber without synechia. In the right eye were many vitreous opacities and white opacities in the periphery of the fundus. In the left eye there were vitreous opacities, a peculiar gray mass above the macula, and a few white spots in the upper portion of the retina. The patient was hospitalized and given five foreign-protein injections with good fever reaction. All tests, including Frei and Brucellosis, were negative. X-ray study of the chest and biopsy of a gland confirmed the previous diagnosis of Hodgkin's disease, and this was concluded to be the cause of the eye findings.

Generalized X-ray and X-ray treatment of the eyes had been given at intervals. Although the general lymphadenopathy had decreased the eye lesions progressed. Visual acuity on March 7, 1944, was R.E. 8/155; L.E. 5/200. The disc of the right eye was somewhat blurred. Scattered throughout the retina were gray-white areas and dead-white peculiar triangular scars. One mass at the 3-o'clock position extended into the vitreous and could be seen with +8.00 lens. The fundus of the left eye could not be seen clearly but many large gray-white areas could be discerned. Further retinal changes were anticipated.

## CORNEAL DYSTROPHY

DR. J. HESTER HAYNE presented the cases of brothers, aged 35 and 23 years. E. S. was seen for the first time in January, 1944, with a complaint of failing vision of more than 15 years' duration. He stated that his brother, four sisters, and his father had the same eye condition. The mother, one sister, and one brother had normal vision. Uncorrected vision was 20/200 in each eye. Ophthalmoscopic examination showed multiple densely opaque areas in each cornea. A good red reflex could be seen, but fundus details were not discerned. With the slitlamp large and small dense opacities in the stroma of each cornea were revealed, also numerous criss-cross lines. Neither the endothelium nor the epithelium was involved.

This patient was examined by Dr. Gifford, who made a diagnosis of Fleisher's familial dystrophy. He was sent to Passavant Memorial Hospital and a keratoplasty was performed on the right eye.

C. S. showed the same corneal changes as his brother, but not so advanced. Both fundi could be seen and were normal. No treatment was recommended at that time. The visual acuity, corrected, was R.E. 20/30; L.E. 20/40 - 2.

## CHRONIC DACRYOCYSTITIS

DR. J. HESTER HAYNE presented M. C., a woman, who was seen for the first time in March, 1944. She complained of tearing of the left eye of more than a year's duration. Examination showed a small amount of thick, white, mucopurulent material which was obtained from the punctum after pressure over the tear sac of the left eye. Irrigating fluid did not pass through the sac.

Under local anesthesia the upper punctum was dilated and a canaliculus knife inserted into the canaliculus, which was then incised along its entire length. A

Weber probe was passed into the nasolacrimal duct, which was then irrigated with normal saline. There had been little tearing since the operation and the patient was almost symptom free.

## ECTOPIA LENTIS

DR. J. HESTER HAYNE presented E. W., a woman, aged 47 years, whose complaint was of poor vision in each eye since early childhood. Both pupils were eccentric, that of the right eye displaced toward the 2-o'clock position and that of the left eye toward the 10-o'clock position. The iris was tremulous. The lens of the right eye was dislocated temporally and posteriorly. There were cortical lens opacities with water clefts especially on the temporal side. The fundus of the right eye could be well visualized through the aphakic portion and appeared normal. The vision was R.E. 1/100; L.E. 4/200.

In October, 1943, a loop extraction was performed on the right eye with minimal vitreous loss and uneventful postoperative course. The vision in the right eye after operation was 20/40 with +5.25D. sph.  $\oslash$  + 1.50D. cyl. ax. 170°; with +3.50D. sph. added he could read J2 at 14 inches.

This patient showed the characteristic long fingers associated with this condition.

## INTRAOCULAR FOREIGN BODY

DR. HELEN HOLT presented B. O., a woman, aged 42 years, who complained of gradually failing vision of the right eye since a foreign body had blown into her eye in February, 1943. The vision at the time of examination was R.E. 20/50, L.E. 20/40. A dense white opacity was easily seen through the undilated pupil on the nasal side of the lens. With the slitlamp a small metallic body was seen protruding through a small hole in the iris at the 3-o'clock position midway between the

pupillary border and the limbus, and seemed to be pivoted in the lens. This body proved nonmagnetic and an attempt was made to remove it through a keratotomy incision. A piece of iris was removed as well. X-ray pictures, however, showed that the foreign body was still present.

In August, the eye became extremely red and painful and vision decreased, and on September 17th, a yellow film could be seen behind the lens. The patient was again hospitalized and given foreign-protein and sulfadiazine therapy in preparation for lens extraction in the hope of removing the foreign body. An intracapsular extraction was attempted, but the fragile capsule was torn and the nucleus expressed in the usual fashion. The pus was expelled from the back of the lens. Recovery was uneventful but a secondary membrane remained and X-ray pictures showed the foreign body was still present. It was concluded that the wire was caught in the posterior part of the cornea. In March, 1944, vessels had invaded the cornea in the upper nasal quadrant at the site of the original incision, and at the lower limbus, and the tissues were becoming hazy. Many pelletlike brown granules were present over the surface of the iris. On March 25, 1944, another attempt was made to remove the wire through a keratotomy incision, with a successful result. Since then the cornea has cleared remarkably, the vessels have receded and the granules on the iris were rapidly disappearing. Needling of the membrane will be done at a later date.

#### KERATOCONJUNCTIVITIS SICCA

DR. HELEN HOLT said that Mrs. N., aged 67 years, was seen in September, 1942. The lid margins, which were thickened and red, were caked with dried secretions and the conjunctiva was intensely injected. Visual acuity was R.E.

20/40; L.E. 20/100. Both lower fornices were partly obliterated by bands of scar tissue. The corneas were hazy with many epithelial scars, and loops of vessels had invaded both corneas at the limbus. There were many fine staining areas. Treatment with sodium sulfathiazole drops and sulfathiazole ointment was instituted for several weeks with slight improvement.

Dr. Gifford suggested that this was probably a keratoconjunctivitis sicca masked by the tremendous secondary infection. The Schirmer test was performed and there was no tear secretion. Locke's solution with gelatin and olive oil gave considerable relief. Closure of the tear ducts will probably have to be performed later.

Robert Von der Heydt.

## COLLEGE OF PHYSICIANS OF PHILADELPHIA

### SECTION ON OPHTHALMOLOGY

April 20, 1944.

DR. WARREN S. REESE, *chairman*

#### A CASE OF PSEUDOBUPHTHALMOS

DR. WILFRED E. FRY, and DR. L. B. COHEN presented a boy, aged five years, who was seen in December, 1939, for the first time. His mother stated that his right eye had turned in since the age of two years, following convulsions. Examination at that time was negative except for internal squint and amblyopia of the right eye.

He was seen again in May, 1942, at which time the vision was 20/20 in the left eye and no pathologic change in the fundus was noted. When again examined in September, 1942, he stated that there had been a steady diminution in vision. The visual acuity at this time was about 1/60,



but if he looked rapidly to one side and back again, 6/60 was obtained.

Fundus examination revealed in the left eye a cloud of vitreous opacities in the posterior portion obscuring the optic disc and the macula, and several small whitish areas in the retina. No retinal detachment was noted, nor was the pupillary reflex changed. A diagnosis of uveitis was made.

General studies including tuberculin tests were negative. Mixed treatment was tried, also a course of tuberculin therapy, but neither appeared to affect the condition. The patient was admitted to the Wills Hospital on January 14, 1944, at which time the fundus picture was essentially the same. While in the Hospital a flat retinal detachment developed. All general studies at this time, including X-ray studies of the skull and orbit, were negative.

Examination with the corneal microscope revealed that the cornea was generally clear throughout, the anterior chamber deep, and the aqueous somewhat turbid; it contained some cells. The lens was clear throughout. There were granules and cells throughout the vitreous chamber.

While in the Hospital, it was observed that several small hemorrhages appeared in the upper temporal retina. The patient was discharged from the Hospital with the tentative diagnosis of Coats's disease, proliferating retinitis, detached retina, uveitis, and massive exudate.

Because of his defective vision the patient was admitted to the Overbrook School for the Blind. A subsequent examination at this institution revealed that with oblique illumination the upper edges of a mass could be seen which was probably a dislocated lens resting on a detached retina. In the temporal periphery, a streak of hemorrhage could be seen on

this mass, which represented organized tissue, probably on the surface of the detached retina. The diagnosis was uveitis, retinal detachment, and dislocated lens of unknown etiology.

In December, 1943, the tension was found to be elevated. There was ciliary injection, a ciliary staphyloma, and a small amount of hemorrhage in the anterior chamber. Enucleation was advised and performed January 22, 1944.

The pathologic report was as follows: "A section of the eye measured 32 by 25 mm. The diameter of the cornea was 10 mm., and the anterior chamber 4 mm. in depth. The lens was subluxated. A tumor mass filled most of the interior of the eye. This mass was roughly in two parts; first, a uniform layer lining the inside of the globe and varying from 2 to 3.5 mm. in thickness, and, secondly, an irregular mass in the center of the globe. The general arrangement of the cells was in pseudorosettes. The cells were irregularly rounded with dense nuclei and little cytoplasm. Tumor tissue invaded the optic nerve and the anterior chamber."

The diagnosis was (1) retinoblastoma; (2) secondary glaucoma; (3) pseudophthalmos.

Before exenteration of the orbit was performed, the boy died due to intracranial invasion.

#### A CORNEOSCLERAL SUTURE FOR INTRA-OCULAR SURGERY

DR. CARROL R. MULLEN stated that since 1939, he has used a corneoscleral suture which has been beneficial in routine extractions, lens loopings, and emergencies associated with cataract operations. Because of an established procedure of introducing this suture into the tissues, prompt closure can be made by the surgical assistant without interference in the normal routine of the operator's tech-

nique. This rapid closure also tends to prevent loss of vitreous.

In addition, the use of this technique makes possible a uniform removal of the suture so that there is little danger of re-opening the section. Other features of most cataract sutures are included—double closure of the corneoscleral section, tendency toward more rapid healing, less iris prolapse, lessening of postoperative corneal astigmatism, sufficient security that the patient may be allowed early use of the other eye, and in some cases the patient can be safely allowed out of bed sooner, if necessary. Perhaps the chief feature of this suture is the ease of its adaptation to removal of dislocated and subluxated lenses, and prevention of vitreous escape.

The eye is prepared for operation in the usual method. Using a #6-0 black braided silk with a three-eighths circle cutting edge an atraumatic one-half inch needle is passed through the cornea from the temporal to the nasal direction 1 to 1.5 mm. under the upper limbus between the 11:30- and the 1:30-o'clock positions. This is pulled through until locked by a previously inserted double knot. The direction of the suture is then reversed and passed directly above through the bulbar conjunctiva, and into the episcleral tissues 1 to 2 mm. above the limbus. The longer free end is not cut away after removal of the needle. The looped continuous nasal portion is then dressed out of line of the incision, and the short, free temporal end is dressed downward over the cornea. This permits an opening for the section.

It is important to note that at the entrance through the cornea, the knot prevents further passage through this cornea. The long strand of suture after coming from the sclera temporally remains so that a surgical assistant, who is out of the way of the operator, can make rapid closure of

the wound upon extraction of the lens. The routine placing of the knot at the temporal end of the corneal bite informs the surgeon that upon removal the suture should always be severed nasally so that the knot cannot be pulled through the tissue or break open the healing corneoscleral section.

In routine cataract operations the assistant closes the nasal loop gradually as the extraction is proceeding so that immediately upon completion of the lens removal there is a firm closure of the incision. The two free ends are then tied firmly but not tightly with the closing knot over the scleral surface, using Nugent utility forceps. Irrigation and toilet of the anterior chamber is performed safely after the suture is tied through either temporal- or nasal-section openings.

In extraction of dislocated or subluxated lenses the initial technique of suture placement is followed out, but the assistant makes rapid closure of the section with traction on the free end of the suture as soon as the incision has been completed. This immediately tends to prevent vitreous loss. If the operator should use a lens loop, this is inserted through the temporal opening and the lens is moved into position directly under the cornea. The assistant continues to hold the section closed. The operator then extracts the lens through the temporal opening, the assistant relaxing his hold on the suture just sufficient to allow the lens to come through, and then makes rapid closure by traction on the long free end of the suture. Complete closing of the suture is in the customary way.

The suture is usually removed on the seventh day. The surface anesthesia should be complete. The nasal band is cut with sharp pointed scissors, preferably through that strand exposed above the sclera. The suture is then removed with a

wet applicator or a forceps without difficulty.

*Discussion.* Dr. Charles R. Heed said that within the past year he had occasion to operate on four patients who suffered from secondary glaucoma. In two cases there was a total dislocation of a hypermature cataract in the anterior chamber. The third patient had a partial rupture of the zonule. A fourth patient had a high degree of myopia and a mature cataract with a ruptured zonule from the 11- to the 1-o'clock position. In all four cases a loop extraction was performed, and the incision closed with the single suture as demonstrated by Dr. Mullen.

The absence of vitreous loss and iris prolapse in these four cases, he said he attributed to the control of the suture during the operation, and the firm closure when tied.

Dr. William Zentmayer said that the suture which has been described here as a Stallard suture is almost exactly like the one devised by Liegard in 1913. It was brought to attention shortly after that by Dr. S. Lewis Ziegler. It differs only in having a knot at the end of the suture, which Dr. Mullen rightly considers an important modification. The idea of having a knot at the end of the suture, so that it does not pull through the corneal tissues, was suggested by Dr. Frish of Atlantic City, and is referred to by Dr. Ellett in his review of cataract operation stitches, "as most ingenious." So Dr. Mullen's suture is really a combination of the two. If you must complicate your cataract operations with corneal sutures, doubtless the one described is a good one to use.

Dr. I. S. Tassman said he had used this same suture ever since he had employed a suture in cataract extractions, and never knew just what the name of the suture was. He agreed with Dr. Mullen that the knot is an advantage, and is not difficult

to apply. Another advantage is that the entire suturing is completed before the section is made, which is a distinct advantage over those that are completed after the section is made. Lastly, this suture required the least amount of manipulation in its application.

Dr. C. E. G. Shannon said he had lately been employing the suture routinely in cataract extractions and found it extremely helpful, especially as it eliminates the threat of loss of vitreous.

#### ORBITAL CELLULITIS SUCCESSFULLY TREATED WITH PENICILLIN

DR. HENRY O. SLOANE (by invitation) presented a paper on this subject.

#### TRAUMATIC PERFORATIONS OF THE EYEBALL—AN ANALYSIS OF 50 CASES

DR. GLEN G. GIBSON reviewed the records of 50 consecutive traumatic perforations of the eyeball. Twelve percent of the cases were due to chopping wood. A conservative regime was advocated in all except the most severe injuries. Suturing of the wound was considered undesirable if it could be avoided. Careful X-ray study was advised, as sometimes it is possible to overlook small foreign bodies. Prompt resection of prolapsed uveal tissue was recommended. None of the eyes were removed as a prophylactic procedure for sympathetic ophthalmia. Foreign-protein injections, starting on the day of the injury, were advised as being the most effective form of treatment in addition to routine procedures. Ninety-three percent conservatively treated eyes were saved, and 14 percent had 6/10 vision or better.

*Discussion.* Dr. Edmund B. Spaeth said that the high incidence of accidents to the globe while working with wood is unnecessary and deplorable. The percentage which Dr. Gibson quotes is not too high. These injuries, because of the impact from a relatively large foreign body, also have

the factor of contusion. It is interesting that very recently three such injuries were seen; one resulted in dislocation of the lens into the anterior chamber without perforation of the globe. In the second case the globe was perforated, and there was an almost complete iridodialysis with a posterior dislocation of the lens. The prognosis in this eye was grave. In the third case there was a group of retrobulbar wood particles, and in spite of a discharging fistula of the superior cul-de-sac, and an X-ray shadow suggesting a retrobulbar foreign body, this was undiagnosed for several months.

Very recently, in consultation, a fourth patient was seen with a sliver of wood driven into, but not through the cornea.

Hospitalization is absolutely necessary. Every traumatism to the globe with perforation is potentially, and for the first 48 hours at least, a lost eye. Hospitalization permits controlled rest, the possibility for detailed, meticulous, continued study, and necessary X-ray examinations. Without hospitalization the posttraumatic and postoperative foreign-proteid therapy, so necessary, cannot be carried out.

He said Dr. Gibson mentioned two situations wherein early surgery is necessary; the first, when further herniation of the ocular contents is imminent, and the second, when wound apposition cannot be achieved by a pressure bandage.

He said he would like to add a third to this—any scleral laceration should be sutured. If the scleral rupture is by impact and over the ciliary body, certainly sympathetic ophthalmia may occur as the result of continued uveal irritation. This is the usual sequence rather than uveal insult from a single uveal traumatism. If the scleral laceration is the point of entrance and exit for removal of a foreign body, it must be surgically closed and treated with diathermy. An intact overlying conjunctiva is no protection against vitreous

fistula, continued bleeding, proliferating retinitis, and a retinal separation. On the other hand, scleral sutures and immediate diathermy are of assistance in preventing these.

Dr. Gibson mentioned the resection of prolapsed uveal tissue. Dr. Spaeth wished to augment this by adding these words, "and the release of the edges of the incarceration after the resection." If the wound is very recent, is clean, and the iris is not macerated and lies subconjunctivally, there is no reason why one should not attempt to replace it, even using a basal peripheral iridotomy to facilitate this. After the resection of a prolapsed iris, the edges or pillars of the coloboma of the iris should be pushed free from the edges and the angles in the lines of the irregular lacerations wherein they were formerly incarcerated. This applies especially to corneal traumatisms with prolapse of the iris through a corneal laceration. It also is equally applicable to limbic and nonlimbic scleral laceration with prolapse and incarceration of the ciliary body. In suturing these, one must be very careful that a knuckle of uvea is not incarcerated in the scleral incision line or scleral laceration.

In cases of perforation with an intraocular foreign body while it is desirable to remove the foreign body immediately, it frequently is not necessary and occasionally it is unwise. Nonmagnetic foreign bodies are to be removed, if possible, when the fundus is clear. Vitreous hemorrhage will prevent the use of an endoscope or the ophthalmoscope. Foreign bodies incarcerated in the ciliary body, and entangled in the retina, must be very carefully studied as to the means of removal to prevent subsequent and irrevocable ciliary-body and retinal damage. Possible double perforations with a foreign body lying extraocularly need considerable time for adequate study and diagnosis. This

does not excuse procrastination, nor unnecessary delay, but it does grant adequate time for studying and planning the surgical approach.

In every case of perforation of the globe wherein there is a possibility of separation of the retina pinhole glasses should be worn from time of immediate hospitalization through the recovery. It seems that this plan has kept down the incidence of retinal separation. Of course, this observation may not be factual, as so many other safeguards against this complication also are being used at the present time. Nevertheless, it seems worthwhile.

Dr. Gibson mentioned the necessary medical care of these cases. The emphasis which he put on it is well taken. He said that in speaking with a man in the western part of the state, who had had a tremendous experience in industrial ophthalmology, the question was asked as to the value of sulfa drugs in preventing post-perforation panophthalmitis. It was hoped to obtain a comparison of the incidence of this prior to routine sulfa therapy and since routine sulfa therapy. He said that formerly infection occurred in 40 percent of cases, but since the routine use of sulfa therapy, this was reduced to about 20 percent. Dr. Gibson's incidence of infection is half of that. Other factors mentioned by Dr. Gibson which might be equally important are: (1) an adequate preoperative preparation; (2) celerity; (3) excellence of the surgical manipulation; and (4) the type of surgery carried out. It seems perhaps wise to continue using the sulfa drugs as a prophylactic measure in the presence of perforating injuries.

Intravenous typhoid therapy is a sound proved means of combating intraocular inflammation and, almost of equal certainty, intraocular infection. Under it the temperature response should be  $103^{\circ}$  F.

and even more. Because of this, the dosage must be definitely outlined, in that temperature responses of below  $102^{\circ}$  are not adequate. He said he was certain that this form of nonspecific proteid therapy had been the means of saving many eyes which would have been lost. He said he was not sure that boiled milk is as effective.

Dr. Gibson states that in his series no eyes were removed as a prophylactic procedure against sympathetic ophthalmia. The nondevelopment of sympathetic ophthalmia in 47 cases, in which the eyes were retained, apparently substantiates his judgment. There is no doubt that an eye with a major traumatism in which the injury is so severe that the globe is lost, peradventure of any doubt, should be immediately enucleated. To the other extreme, prophylactic enucleations are a fallacy, and if carried out as such will simply mean the unnecessary loss of many eyes.

The development of sympathetic ophthalmia can be combated to a remarkable degree by the prevention of chronic irritation to the uvea through rational reparative surgery and adequate posttraumatic and postoperative foreign-proteid therapy under the circumstances of our civilian ophthalmic practice.

Further careful, detailed, meticulous, and repeated examinations should enable one to enucleate, if necessary, in sufficient time to prevent the establishment of the disease in the other eye. Sympathetic ophthalmia is no respecter of persons. It has appeared following rational intraocular surgery; with a single needle perforation of the globe; and under circumstances of a very long incubation period. It, therefore, behooves one to weigh carefully all the circumstances in each individual case. One should be careful that consistent conservatism also carries with it meticulous attention, and is not a simple laissez-faire attitude. The first is laudable; the second

deplorable. He quoted Dr. Ernst Fuchs: "He who has never seen a case of sympathetic ophthalmia develop in a patient under his care is not extraordinarily lucky; he has simply enucleated too frequently." The occurrence of it is, however, tragic. It was my misfortune to see in an eight-year-old child bilateral blindness following limbic penetration by a rose-bush thorn. The case was seen for the first time four days after the accident, and sympathizing inflammation was already established in the other eye.

To recapitulate this most important part of the discussion, rational but thorough reparative surgery, thereby the prevention of continued uveal irritation, and adequate posttraumatic and postoperative medical treatment are the *sine qua non* in the prevention of sympathetic ophthalmia.

Dr. James S. Shipman said that he wished to discuss one statement made regarding the implanting of a gold or bone ball in the presence of an infection. As is well known, it is difficult to make a successful implant when an infection is present. However, if sulfanilamide powder is inserted in Tenon's capsule first, and then the bone or gold ball is implanted, a very nice-appearing artificial eye can be obtained in spite of panophthalmitis or infection of less degree. He said he had had a case in which he was going to do a simple enucleation. The consultant suggested that he use sulfanilamide powder in Tenon's capsule, and implant a bone ball in accordance with the usual Frost-Lang technique. This he did somewhat sceptically, but to his surprise, the ball stayed in with a minimum of reaction. This one exception he said he would like to take to Dr. Gibson's paper. In spite of infection, an implant of bone, gold, or plastic, whichever is preferred, can be inserted in Tenon's capsule, and there is no reason why the same could not be used in the scleral cup, and a much

better appearing and more movable artificial eye be obtained.

Dr. Spaeth did not mention in his discussion the possibility of suturing extensive lacerations of the sclera by means of the atraumatic black-silk sutures. In his experience, he said, this procedure has saved many eyes which otherwise might have been lost. He had seen many cases in which the laceration had been through the cornea, and extended well back into the sclera for a distance of 6 to 10 mm. over the ciliary body, saved by this method. If the ciliary body itself has not been cut or injured, which is something one has to determine by means of a loupe, one can still bring the lips of the scleral wound together by means of the intrasclera sutures, and save an eye that otherwise would be lost. He said this has happened a number of times in his experience, and he had saved, not only an eye, but useful vision. To do this properly, one should have his assistant push away the ciliary body and choroid with a spatula while he inserts the intrascleral sutures to make certain that none of the ciliary body or choroid is pinched off in the closure of the scleral wound.

He said he disagreed with Dr. Gibson on the number of blind eyes that he has saved, which to his mind—and he thinks Dr. Gibson must admit—are potential sources of sympathetic ophthalmia. Indeed, Dr. Gibson apparently has not had many cases of sympathetic ophthalmia in his own practice. Dr. Shipman said his teaching has been that if an eye is badly injured, it is a potential source of sympathetic ophthalmia, and certainly, if it is blind, there is no excuse for leaving it in. His practice has always been to remove such eyes, and, if possible, make an implant in the scleral cup as described by Dimitry, which he thinks gives the ideal result so far as appearance and movability of an artificial eye are concerned.

Why not evacuate the whole contents of the sclera, making certain that all the uveal pigment is removed, put in a bone, gold, or plastic ball, obtain a satisfactory artificial eye, and remove forever the possibility of sympathetic ophthalmia?

Dr. Glen Gibson, in closing, thanked the discussors and said that Dr. Shipman's remarks prove his opening statement that the handling of these cases is a controversial one, and it is one in which a complete unanimity of thought cannot be expected.

He said that the case in which Dr. Shipman successfully used an implant after sulfa therapy in a case of panophthalmitis forces him to relate an experience he had. In one case of panophthalmitis a ball implant was inserted after the removal of

the eye, in the presence of infection, without putting the sulfa drug in, and the procedure was successful. Even though it is not considered the best technique, it can be done.

He disagreed with Dr. Shipman's statement about the removal of all blind eyes. He said that is one of the important points that he wished to make; namely, that many eyes which are blind should not be removed. To the patient it is much more desirable than wearing a prosthesis, and such an eye should be saved. The low incidence of sympathetic ophthalmia warrants the saving of a great many of these eyes even though they are blind.

George F. J. Kelly,  
Clerk.

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## A CONFERENCE ON INDUSTRIAL OPHTHALMOLOGY

The College of Physicians and Surgeons of Columbia University, in coöperation with the National Society for the Prevention of Blindness, held a conference on Industrial Ophthalmology in New York City, May 7 to 11, 1945. Forty-seven ophthalmologists representing the faculty of their respective medical schools, and five medical officers representing government agencies, as well as lecturers and others attended. When one considers that there are but 69 accredited medical schools in this country, a representation of 68 percent testifies to the

importance the subject holds in the minds of the heads of the departments of ophthalmology. Government agencies likewise were impressed with the importance of the conference and sent official representatives from The Surgeon General, U. S. Public Health Service, The Surgeon General, U. S. Army, the Federal Security Agency, the United States Maritime Commission, and the United States Civil Service Commission.

The immediate object of this conference was to initiate the introduction of the industrial aspects of ophthalmology into the curriculum of as many medical schools as possible. Those who attended



the meeting were exposed, some of them perhaps for the first time in concentrated form, to lectures, discussions, and plant visits on the subject of industrial ophthalmology. The program of the meeting has been printed in a previous issue of the Journal, and the Society for Prevention of Blindness will publish, in due course of time, the papers, discussions, and reports of the meeting, which will make valuable reading for all ophthalmologists. One left the conference at the end with many constructive thoughts, much information, and real regret that it was finished. The hosts were gracious and spared no effort to make the conference function smoothly, pleasantly satisfactorily, and above all with profit to all concerned.

The idea of Industrial Ophthalmology as a field of action is relatively recent. It is but a few years since that Dr. Hedwig Kuhn made her first extensive contribution before the Section on Ophthalmology, American Medical Association. As a direct result of her paper, which is an historic landmark, a Joint Committee on Industrial Ophthalmology, representing the three major ophthalmic societies, was established and has been successfully functioning ever since. It has served to focus the attention of ophthalmologists on a field that otherwise might be neglected, to the detriment of the public in many ways. Industry has been quick to see the applications, and has welcomed the pioneers with opened doors. Indeed its demand for this sort of service to the workers far exceeds the available supply of ophthalmologists. We are witnessing here a new facet of the ophthalmic jewel, of which we were not hitherto fully aware. It is truly a sparkling one and it is hoped that more and more young well-trained ophthalmologists will become alert to this new opportunity to serve.

The subject embraces vision, visual skills, job analysis, placement, a knowl-

edge of all hazards and diseases curious to modern industry, and their prevention as well as treatment. It includes all aspects of ophthalmology, and not just refraction, although extensive experience in ophthalmic surgery may not be a necessary requisite. It requires much more than a knowledge of ophthalmology. The well-trained industrial ophthalmologist must be familiar with shop conditions, industrial processes and machinery, toxic substances (chemicals, dust, fumes, gases, heat, and light). He must have a first-hand working knowledge of scientific lighting, fields of view, fields of safety and danger, new concepts of the use of color in industry, and a host of other things, of the existence of which the average eye physician is hardly conscious.

It was wise, therefore, for the hosts of this conference to stimulate department heads of medical schools to think along these lines. The subject was discussed at considerable length by those who attended. The consensus of opinion seemed to be that it belongs to postgraduate teaching primarily, although the matter could be and should be properly introduced in undergraduate lectures in order to spread before the student the various possibilities contained in such a career. The expressed opinions, however, did not go beyond these thoughts and constituted little more than suggestions. These suggestions will undoubtedly bear fruit in time, but in the meantime must not be lost sight of. It is a postwar project of considerable magnitude and great importance. One looks forward with confidence to the first course in Industrial Ophthalmology to be set up in some university, perhaps timidly at first, to be followed in rapid succession by others.

What those who attended this conference witnessed, therefore, was the birth of a new venture or at least the first warnings of gestation thereof, scarcely

realizing it or seeing its implication. All of good will will wish it a powerful and useful future. The College of Physicians and Surgeons of Columbia University and the National Society for Prevention of Blindness have rendered a great service and are to be gratefully congratulated for their vision and farsight.

Derrick Vail.

### MEDICAL JOURNALS IN WARTIME

Among the cultural casualties of a world war is interference with the normal international circulation of medical journals. The greater the number of countries involved, the more completely international boundaries are closed to even indirect mail communication. Not only warring but neutral countries are affected by these difficulties. When the part of France which had at first escaped occupation was overrun by German troops, Swiss medical journals failed to reach the United States, for Switzerland was surrounded on all sides by Axis territories.

During World War I, certain long-established medical journals disappeared permanently. The same tendency has probably developed during World War II. World War I led to formation of the British Journal of Ophthalmology as the amalgamation of a number of old publications; and conscious imitation of this process in the United States led to creation of Edward Jackson's American Journal of Ophthalmology, Third Series.

Russia's *Viestnik Oftalmologii* continued to reach the abstract department of the American Journal of Ophthalmology even after Hitler invaded Russia; but it took a long time to make the journey from Moscow to Denver, having to travel by way of Japan. Pearl Harbor of course put an end to this sort of inter-

communication. An example of the disorganization of peace-time activities from which Russia suffered by reason of the German incursion is the fact that our abstract editor has failed to receive a reply to any of numerous letters addressed to the *Viestnik* staff during the past two or three years.

Before France was overrun in 1940, we had regularly received issues of *Annales d'Oculistique*, one of the world's oldest periodicals dealing with ophthalmology. Afterward, this excellent publication disappeared from our view. But it maintained some sort of continuity under the German occupation of Paris, and a couple of months ago we received ten issues carrying the series down to 1942. Conspicuous features of these issues are obituaries on Henri Lagrange, who died in 1941; on the famous optical scientist Tscherning, who died in 1939; and on Eugène Kalt, who "disappeared" May 9, 1941.

*Archives d'Ophthalmologie*, another well-known French journal, appears to have ceased publication in 1940, but its publishers have recently announced resumption.

The leading German eye journals, *Klinische Monatsblätter für Augenheilkunde* and *Graefe's Archiv für Ophthalmologie*, appear to have carried on throughout the war. We shall await with interest the reappearance in this country of *Klinische Monatsblätter für Augenheilkunde*, which maintained the best ophthalmological abstract department outside the English-speaking countries. It may, however, be supposed that appreciable delay will occur in reestablishment of completely normal exchange relationships.

Early in the war, the excellent journal *Ophthalmologica*, originally *Zeitschrift für Augenheilkunde*, and formerly published in Berlin, moved to Basel, Switzerland. It has not been heard from since

France was fully occupied by German troops; and may have succumbed.

Before Italy's entrance into the war, our abstract department contained abstracts from as many as five Italian eye journals. Scandinavia was represented by *Acta Ophthalmologica*, printed in several languages, and published at Copenhagen; Belgium by the *Bulletin de la Société Belge d'Ophthalmologie*; Poland (up to 1939) by *Klinika Oczna*; Czechoslovakia (to 1937) by *Ceskoslovenska Oftalmologie*. Other publications whose names appeared frequently in the abstract department of the *American Journal of Ophthalmology* were the *Bulletin et Mémoires de la Société Française d'Ophthalmologie* and the *Revue du Trachome*. In addition to the difficulties created by general disorganization, many medical journals are probably suffering from limitation in the supply of paper. It was recently reported that the French Ophthalmological Society hoped to resume its splendid series of monographs as soon as the necessary paper became available.

The Falangist conquest of Spain caused suspension of Marquez's *Archivos de Oftalmologia Hispano-Americanos*, which, however, in the last three or four years has been succeeded by *Archivos de la Sociedad Oftalmologica Hispano-Americana* (see editorial, *American Journal of Ophthalmology*, 1944, volume 27, January, page 86).

Great Britain's ophthalmologists, in spite of bombing raids, have maintained the *British Journal of Ophthalmology* during the war.

For some years past the former American colonies of Spain and Portugal, now all independent republics, have steadily increased their activity in the publication of eye journals. We now maintain exchanges with two Argentine (Spanish-language), four or five Brazilian (Portuguese-language), and two Mexican

(Spanish-language) eye journals, besides reviewing from time to time articles on ophthalmology published in general medical periodicals from Cuba and Montevideo. The Republic of Chili is represented by an eye, ear, nose, and throat journal. Turkey is attempting to carry on an eye journal, India, probably on the threshold of greater developments, issues the *Indian Journal of Ophthalmology* as well as several fairly ambitious general medical journals.

Although only a moderate proportion of the periodical literature of ophthalmology is of distinctive quality, the eye journals of the various countries constitute a great professional debating society, in which are expressed, not merely original investigation into scientific matters, but widely varying experiences and opinions as to ocular conditions and methods of treatment. The fact that a case report or medical essay is not brilliantly original does not necessarily rob it of all value to the reader, who often derives from rather modest literary contributions the same sort of benefit which he obtains from contact with his colleagues during local or national meetings.

W. H. Crisp.

## BOOK NOTICES

**NEURO-OPHTHALMOLOGY.** By Donald J. Lyle, B.S., M.D., F.A.C.S. Clothbound, xiv + 398 pages, 7 charts, 529 illustrations. Springfield, Ill., Charles C Thomas. Price \$10.50.

The field of neuro-ophthalmology is one of increasing growth and importance as our knowledge of the subject expands and particularly as more and more ophthalmologists comprehend their responsibilities in the field. Even so, there are still too few ophthalmologists who have a working clinical knowledge of neurology

insofar as it embraces their specialty. Perhaps the complexity of the subject is such that all but a few have the time, inclination, and opportunity to master it. One has been handicapped also by the fact that the needed information has not hitherto been easily available, but has to be dug out of the extensive literature of neurology and ophthalmology here and there.

Dr. Lyle's book goes a long way toward supplying the needed information in a most pleasing fashion. The illustrations, all original, form one of the most attractive features of the book. They have been chosen with great care to illustrate the case discussions and accomplish this purpose well. They represent years of painstaking investigation to get just the right picture that fits the case, and include reproductions of X-ray plates, fields-of-vision charts, brain cross sections, other autopsy material, and fundus photographs, many of which are stereoscopic.

There are many excellent chapters. The one on "Syndromes which include eye symptoms" and another on "Eye manifestations of head injuries" are particularly noteworthy. Those of us who are fortunate enough to know Dr. Lyle have been aware for a long time of his interest, keenness, and critical studies in the entire subject of neuro-ophthalmology and can attest to his clinical experience, knowledge, and judgment.

There is an extensive bibliography and satisfactory index. The charts in the flap attached to the front of the rear cover are original and useful. They are designed for recording lesions affecting the visual system, and if used properly and freely, make for accuracy of observation and sharpness of judgment.

The paper and print are excellent and

reflect the high standards and good taste of the publisher.

And yet the book, good as it is, does not quite fill the need. It often assumes more knowledge of neurology, neuro-histology, and anatomy than the average ophthalmologist possesses. It is more than an atlas, more than an introduction to the subject, but not quite elaborate nor extensive enough for a complete reference text. Representing as it does the author's own experience, one can understand that he has been reluctant, perhaps, to borrow from others. But if one wants to find a good illustrative case of a particular neuro-ophthalmic condition, the chances are that he will find it in Dr. Lyle's book.

Derrick Vail.

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EYE, EAR, NOSE, AND THROAT  
MANUAL FOR NURSES. By Roy  
H. Parkinson, M.D., F.A.C.S. Fifth  
edition. Clothbound, 247 pages, 82 illustrations. Saint Louis, C. V. Mosby  
Company, 1944. Price \$2.25.

In general this book, the first edition of which appeared in 1925, is a practical and useful one for nurses who wish to have some training in eye, ear, nose, and throat. It is well arranged, brief, concise, and gives procedures in general usage. Due to its brevity it omits some phases of ophthalmic treatment, and there are a few inaccuracies, such as these mentioned: P. 82, "there are seven extrinsic muscles." The levator is included but not the orbicularis. The "normal fundus" color plates show an abnormal macula. P. 98, "Pinguecula is a small collection of round cells in the conjunctiva." It seems to me that it is not quite so complete and accurate as is a similar book by Dennison and Eklund.

Trygve Gundersen.

# ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

## CLASSIFICATION

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|--|--|
| 1. General methods of diagnosis                        | 10. Retina and vitreous                                |
| 2. Therapeutics and operations                         | 11. Optic nerve and toxic amblyopias                   |
| 3. Physiologic optics, refraction, and color vision    | 12. Visual tracts and centers                          |
| 4. Ocular movements                                    | 13. Eyeball and orbit                                  |
| 5. Conjunctiva   | 14. Eyelids and lacrimal apparatus                     |
| 6. Cornea and sclera                                   | 15. Tumors   |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries   |
| 8. Glaucoma and ocular tension                         | 17. Systemic diseases and parasites                    |
| 9. Crystalline lens                                    | 18. Hygiene, sociology, education, and history         |
|  | 19. Anatomy, embryology, and comparative ophthalmology |

## 2

### THERAPEUTICS AND OPERATIONS

Alvaro, M. E. Clinical effects of the local use of sulfonamides on the eyes. *Amer. Jour. Ophth.*, 1945, v. 28, May, pp. 497-510. (Bibliography.)

Americano Freire, S., and Rocha, H. Hydrochloride of benzyloil-diethyl-amino-ethanol (cycloplegina) as cycloplegic, mydriatic, and local anesthetic. *Ophthalmos*, 1944, v. 3, no. 3, pp. 287-310.

This drug was synthesized in a Brazilian laboratory. Various experimental studies on animals are described. In 3-percent strength, the drug is said to be an ideal cycloplegic. Being somewhat irritating, its use should be preceded by a drop of neotutocaine, 0.5 percent. The addition of 1-percent benzedrine is said to shorten the time within which mydriasis appears. The cycloplegic and mydriatic qualities of the new drug arise from its power to block the muscarine action of acetylcholine. In 3-percent strength its anesthetic effect upon the human cornea is weaker and less durable than that of a 5-percent solution of cocaine.

Cycloplegia is manifest generally in twenty minutes, lasting an average of eight hours. Mydriasis occurs more slowly than cycloplegia. (14 illustrations, references.) W. H. Crisp.

Atkinson, W. S. The evaluation of newer drugs in ophthalmology. *New York State Jour. Med.*, 1944, v. 44, Dec. 1, p. 2590.

The true worth of penicillin in treatment of the human eye is difficult to appraise. Reports of its use experimentally in the treatment of intra-ocular infection are encouraging, and striking results may be expected in the treatment of infections now considered hopeless. The author mentions Heath's recommendation of tyrothricin locally in the treatment of epidemic keratoconjunctivitis, as well as in pneumococic conjunctivitis, dendritic keratitis, and low grade dacryocystitis. Also discussed are pontocaine, novocaine, pentothal sodium (for general anesthesia), and such antiseptics as metaphen. As to sulfonamides, the consensus is that in most instances a large dose for a short period of time is preferable to a small

dose over a long period. The author also discusses the use of prostigmine, carbominolcholine chloride, and sorbitol in glaucoma.

Theodore N. Shapira.

Bellows, J. G. The evaluation of penicillin in ocular therapeutics. *Jour. Indiana State Med. Assoc.*, 1945, v. 38, Jan., p. 4. (See *Amer. Jour. Ophth.*, 1944, v. 27, Nov., p. 1206.)

Bonfioli, A. Iontophoresis in ophthalmology. *Ophtalmos*, 1944, v. 3, no. 3, pp. 262-283.

The introductory discussion considers the technique of administration and the various substances used by this method. The tissues subjected to this form of treatment include the conjunctiva, the sclera, the cornea, the cataractous lens (the calcium ion being used by Baró, Cantonnet, and the author in cases of incipient cataract). Attempts have also been made to utilize iontophoresis in the treatment of glaucoma (for application of a lithium salt and of pilocarpine) and iritis (sodium iodide). (8 illustrations.)

W. H. Crisp.

Campos, Evaldo. Effects of retrobulbar anesthesia on ophthalmotonus. *Rev. Brasileira de Oft.*, 1945, v. 3, March, pp. 143-164.

From a series of measurements made before and after the induction of local anesthesia with various combinations of anesthetic drugs, the author arrives at the following conclusions: Repeated instillation of 5-percent cocaine solution with adrenalin causes a marked drop in ophthalmotonus, which is further accentuated by the retrobulbar injection of novocaine with adrenalin. The retrobulbar injection causes a

greater drop in tension if 5-percent cocaine with adrenalin was not previously instilled. Repeated instillation of cocaine 5 percent with adrenalin has greater hypotensive effect than retrobulbar injection of 4-percent-novocaine solution with adrenalin. The hypotensive effect of cocaine instillation without adrenalin is inconstant (approximately 50 percent of the cases). In many cases, retrobulbar injection of 4-percent-novocaine solution, even without adrenalin, reduces the tension. In the great majority of cases the drop in tension appears within the first four minutes after the retrobulbar injection (7 tables, references.) W. H. Crisp.

Cole, W. T. S., Hamilton-Paterson, J. L., and Sorsby, A. The suitability of experimental corneal lesions for evaluating local sulphonamide therapy. *Brit. Jour. Ophth.*, 1945, v. 29, March, pp. 150-155.

Attempts to obtain experimental corneal infections in the rabbit for the purpose of studying the effects of local sulfonamide therapy are reported. *Pneumococcus* types 3 and 19 (which are pathogenic to the rabbit) as well as *streptococcus hemolyticus* and *staphylococcus aureus* by direct inoculation, failed to give lesions suitable for therapeutic tests. Twelve strains of *B. pyocyaneus* were tested in vitro against sulfonamide. All strains required a concentration of about 350 mg. of sulfanilamide per 100 ml. to inhibit their growth. It is concluded there is no valid experimental evidence that local sulfonamide is efficient in infections of the outer eye. (5 tables, references.)

Edna M. Reynolds.

Heerma, J. C. Transient myopia and disturbance of accommodation in the

same eye after sulfanilamide medication. South African Med. Jour., 1944, v. 18, Nov. 11, p. 358.

After a brief review of the toxic effects of the sulfonamides on ocular tissues, the author reports the incidence of transient myopia occurring in a 32-year-old male after use of 26 gm. total of sulfanilamide. Induced myopia amounted to 4.50 D. in the right eye and 5.50 D. in the left eye. The amplitude of accommodation was likewise reduced from 9.5 D. in each eye to 6. D in the right eye and 8. D in the left eye. The author feels that the cause lies in both a swelling of the lens and an edema of the ciliary body. Ciliary spasm with resultant myopia is ruled out by the occurrence of a partial mydriasis rather than miosis. Pain incident to attempts at accommodation also suggests an edematous process.

Owen C. Dickson.

Keyes, J. E. L. Penicillin in ophthalmology. Jour. Amer. Med. Assoc., 1944, v. 126, Nov. 4, p. 610.

Penicillin is the drug of choice in the treatment of ophthalmic diseases caused by gonococci, streptococci, and sensitive staphylococci; should be tried in diseases caused by *Neisseria intracellularis* meningitis, *Neisseria catarrhalis*, and pneumococci; is optional in infections by *C. diphtheriae*, *Cl. welchii*, *Actinomyces bovis*, and *Treponema pallidum*.

When effective, the relief afforded by penicillin is usually prompt. Large doses are indicated, and continuance of therapy until complete cure is obtained, otherwise there is danger of producing penicillin-resistant strains of organisms. Its use is suggested as a prophylactic in certain intraocular operations and in ocular injuries. In

diseases caused by noninfectious processes such as allergy, the removal of a secondary infection by penicillin is helpful, but obviously leaves the primary problem unsolved.

Penicillin solutions are rather unstable at room temperatures. The ointment will keep for at least a month at room temperature and six months when refrigerated. Heat destroys penicillin and resterilization is not feasible.

Robert N. Shaffer.

Leopold, I. H. Intravitreal penetration of penicillin and penicillin therapy of infections of the vitreous. Arch. of Ophth., 1945, v. 33, March, pp. 211-216.

After reviewing the literature on the use of penicillin in combating infections of the vitreous, the author describes experiments on rabbits. In eyes with an inflamed anterior segment, subconjunctival injection and injection into the anterior chamber produced levels in the vitreous above 0.15 Oxford unit per c.c. Parenterally administered penicillin never reached this concentration in the vitreous. Intravenous administration of penicillin produced at most a concentration of penicillin about 0.08 unit per c.c. in the vitreous of the inflamed eye.

The author's conclusions follow: Intramuscularly or intravenously administered penicillin in a concentration of 4,000 units per kilogram failed to produce detectable concentrations of penicillin in the vitreous humor of the normal rabbit eye. Prolonging the length of time that penicillin remained in the blood stream, by means of a penicillin-gelatin vasoconstrictor preparation, failed to increase intravitreal penetrations in the normal rabbit eye. Subconjunctival injection of penicillin, or injection into the anterior chamber,

produced detectable concentrations of penicillin in the vitreous of the normal rabbit eye. All methods of administration produced higher concentrations in the vitreous humor in the presence of infection of the anterior chamber than in normal eyes. Theoretically adequate concentrations in the vitreous were obtained by subconjunctival injection or by injection into the anterior chamber in the inflamed rabbit eye. Such levels were adequately maintained for three hours after one injection. Higher concentrations were obtained after iridectomy than in normal eyes after injections of penicillin into the anterior chamber. Intravenously administered penicillin failed to stop the progress of experimental ectogenous infection in a vitreous, caused by penicillin-sensitive strain of *Staph. aureus*. Repeated subconjunctival injections and injections into the anterior chamber halted intravitreal infection by *Staph. aureus* in some rabbit eyes. Intravitreal injection halted ectogenous infections of the vitreous by *Staph. aureus* in all eyes receiving one injection of more than 500 Oxford units of penicillin. Lower concentrations, including those of 5 units per injection, were partially successful. (3 tables, references.)

R. W. Danielson.

McArevey, J. B. Postoperative hemorrhages. *Trans. Opth. Soc. United Kingdom*, 1943, v. 63, pp. 407-409.

The author divides the causes of intraocular hemorrhage into three main groups: those due to general conditions, operative trauma, and complications during convalescence.

Beulah Cushman.

Moracs, Rolim de. The chief indications of electrotherapy in ophthalmol-

ogy. *Opth. Ibero Amer.*, 1944, v. 6, no. 2, pp. 149-163.

The subject is reviewed as to the use of the galvanic current, the faradic current, high frequency, electromagnetic radiations (ultraviolet and heat rays), and roentgen and radium therapy, with brief mention of roentgen therapy of glioma. (References.) W. H. Crisp.

Purvis, Victor. *Surgical minutiae*. *Trans. Opth. Soc. United Kingdom*, 1943, v. 63, pp. 302-313.

The author reviews some of the changes in surgical technique that he has seen develop during and since his training. He concludes that inadequate coöperation of the patient was due to the inadequate control by the surgeon. He favors conjunctival cultures. The complete local anesthetic includes: anesthesia of the eyelids by novocaine; anesthesia of conjunctiva and cornea by cocaine; anesthesia of the whole eye by retrobulbar injection of novocaine, inserting the needle through the upper lid above the upper edge of the tarsal plate, and through the superior rectus for 2 mm.

Purvis further advises: use of lid sutures; a bridle stitch of the superior rectus; application of the fixation forceps either at the nasal limbus or at the insertion of the internal rectus during puncture and counterpuncture; corneal suture 2 mm. from and parallel to the limbus in the superficial layers of the cornea and in a parallel position in the sclera at the insertion of the superior rectus; peripheral iridectomy on each side of the corneal suture; and extracapsular extraction.

Beulah Cushman.

Rycroft, B. W. Penicillin and the control of deep intraocular infection.



Brit. Jour. Ophth., 1945, v. 29, Feb., pp. 57-87. (See Section 16, Injuries.)

Smith, I. C., and Struble, G. C. The use of artificial-fever therapy in ophthalmology. Amer. Jour. Ophth., 1945, v. 28, May, pp. 461-471. (References.)

Struble, G. C., and Bellows, J. G. Studies on the distribution of penicillin in the eye and its clinical application. Jour. Amer. Med. Assoc., 1944, v. 125, July 8, p. 685.

In dogs and rabbits it was found that the concentration of penicillin in the tissues of the eye, after large intravenous injection, was highest in the extraocular muscles, then in decreasing order in sclera, conjunctiva, tears, chorioretinal layer, aqueous, vitreous, and cornea. Concentration rose rapidly in the first hour, particularly in the relatively vascular tissues, then dropped precipitously, barely a trace remaining at the end of three hours. Penicillin administered intravenously and intramuscularly in amounts comparable to therapeutic doses reached such slight concentrations in the eye as to be immeasurable by ordinary methods. After subconjunctival injection very high concentrations were reached in the cornea, iris with ciliary body, conjunctiva and sclera. A moderate amount was present in the aqueous and vitreous. The lens and the posterior half of the chorioretinal layer showed negative results. After constant corneal baths of penicillin, 20,000 units to the c.c., similar results were obtained, but the concentrations were even higher except in the conjunctiva and sclera, where they were lower.

The clinical results of local application of penicillin in external ocular disease are encouraging. But in a few cases of deeply situated inflammatory

lesions of the eye, little improvement is noted despite massive intravenous injections. Robert N. Shaffer.

Toledo, Renato de. Anesthesia in ocular surgery. Ophthalmos, 1944, v. 3, no. 3, pp. 235-242.

The author discusses particularly the use, for infiltration, of novocaine, which he employs in 2 to 4-percent solution with a little adrenalin. He proceeds to consider the barbiturates, especially those used for general anesthesia, in regard to which he finds a need for extreme caution on account of the possibility of a fatal outcome. (2 tables, one graph, references.) W. H. Crisp.

### 3

#### PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Adrian, E. D. The dominance of vision (Doyne Memorial Lecture). Trans. Ophth. Soc. United Kingdom, 1943, v. 63, pp. 194-207.

The author, a physiologist, was aroused to try to explain hysterical blindness by a patient who in order to be blind had to keep his eyes "screwed up" and wore dark goggles. Thus the only way the patient could prevent himself from seeing was by preventing visual stimuli from reaching the retina. In man vision is a dominant sense, and the patient described illustrates the special claim which vision makes on the attention and the consequent difficulty in ignoring what is in front of the eyes. The neural apparatus for opening and closing the eyes is very closely linked with the neural apparatus for visual attention and consciousness.

In a normal brain there is a more or less regular series of electrical potential waves (Berger's  $\alpha$  rhythm), detectable at the surface of the head. The

rhythm is a product of the undisturbed brain, and any kind of visual attention will abolish it. The  $\alpha$  waves are greatest in the occipital region. The author concludes that the cerebral potential rhythm is very closely related to the mental events which constitute vision, and gives some information about the neural changes which occur when we decide to become attentive or inattentive to the visual field. (6 figures, references.) Beulah Cushman.

Americano Freire, S., and Rocha, H. Hydrochloride of benzyloil-diethyl-amino-ethanol (cycloplegina) as cycloplegic, mydriatic, and local anesthetic. *Ophthalmos*, 1944, v. 3, no. 3, pp. 287-310. (See Section 2, Therapeutics and operations.)

Borley, W. E., and Tanner, O. R. The use of scleral resection in high myopia. *Amer. Jour. Ophth.*, 1945, v. 28, May, pp. 517-520. (References, fields.)

Heerman, J. C. Transient myopia and disturbance of accommodation in the same eye after sulfanilamide medication. *South African Med. Jour.*, 1944, v. 18, Nov. 11, p. 358. (See Section 2, Therapeutics and operations.)

Lavery, F. S. Ocular dominance. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 409-435.

The author emphasizes ocular dominance as an important factor in the symptoms of asthenopia and in the learning processes. His report covers the examination of 590 persons, and an investigation into sidedness in animals. No dominance was found among birds or quadrupeds. Development of centers in the opposite hemisphere produces conflict which may manifest itself in many different ways, such as

stuttering, and incidental difficulties in reading, writing, and arithmetic. Many of these children respond satisfactorily with reversion. Tests for dominance are listed. Lavery concludes that the role of the dominant eye must be given consideration when prescribing glasses. (4 figures, 4 tables, references.)

Beulah Cushman.

Mann, W. A. Direct utilization of the eye as a camera. *Amer. Jour. Ophth.*, 1945, v. 28, May, pp. 451-460; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42. (12 figures, references.)

Murray, Elsie. Anomalies in color vision. *Scientific Monthly*, 1943, v. 57, Oct., p. 322.

Great numbers of young men anxious to help in the military services have been disqualified as "color blind." The present-day charts are not analytic, determining only the average anomaly; and they are not fine enough to diagnose or differentiate the various deviations from the typical. The author suggests that many cases are probably semipathologic, borderline. Thus the color-blind are not segregated from the color-weak.

Francis M. Crage.

Ogle, K. N., and Madigan, L. F. Astigmatism at oblique axes and binocular stereoscopic spatial localization. *Arch. of Ophth.*, 1945, v. 33, Feb., pp. 116-127.

The correction of astigmatism at oblique axes introduces a meridional magnification of the image on the retina at an oblique axis, which magnification causes a small rotary deviation of the images of all vertical lines in space. This deviation may result in an incorrect apparent inclination of objects, measurable by the space eikonometer.

Tests made on 319 clinical subjects having oblique astigmatism showed

that 74 percent had measurable declination errors. There was good quantitative correlation between the measured declination errors and the declination errors calculated on the basis of the amounts and axes of astigmatism. The authors state this correlation to be evidence that the anatomic and physiologic organization of the two retinas in the binocular processes of vision had become fixed, independent of the development of the refractive errors.

In the majority of the subjects the measured error was less than the calculated error. The difference between the measured and the calculated error may be explained by cyclotorsions, by a basic aniseikonic error, by anomalous organization of the retinas, or by the existence of a compensatory mechanism.

It is suggested that, if patients find astigmatic corrections difficult to wear, attention should be given to the possibility that the difficulty may be due to aniseikonic errors resulting from those corrections. (11 figures, 3 tables, references.)

John C. Long.

Pascal, J. I. On biastigmatism. *Amer. Jour. Ophth.*, 1945, v. 28, June, pp. 644-645.

#### 4

#### OCULAR MOVEMENTS

Ashley, B. J. Uncommon paralysis of extraocular muscles. *Jour. Kansas Med. Soc.*, 1944, v. 45, Nov., p. 380.

The author reports three different and rather unusual cases of paralysis of the extraocular muscles appearing in patients in a United States Naval Hospital: (1) bilateral paralysis of the internal recti muscles with retention of convergence; (2) loss of convergence; (3) bilateral paralysis of the superior oblique muscles.

Theodore M. Shapira.

Beccle, H. C., and Kitching, E. H. Heterophoria and neurosis in flying personnel. *Brit. Jour. Ophth.*, 1945, v. 29, March, pp. 125-132.

The relationship between heterophoria and neurosis is discussed and the literature is reviewed. Fifty-seven cases of heterophoria in flying personnel, where no adequate organic cause could be found, were subjected to psychiatric interview and examination. Fifty were found to be suffering from well marked psychologic illness of which the heterophoria was only one manifestation.

The ultimate prognosis depends more upon the emotional stability of the patient than upon the degree of ocular muscle imbalance which is present. Orthoptic treatment alone may cause the heterophoria to disappear but it will not cure the neurosis or render the patient less vulnerable to a recurrence. Psychiatric examination should precede local treatment, to establish the correct diagnosis as well as to determine appropriate treatment in the individual case. (2 tables, references.)

Edna M. Reynolds.

Burian, H. M. Motility clinic: intermittent (facultative) divergent strabismus. Its influence on visual acuity and the binocular visual act. *Amer. Jour. Ophth.*, 1945, v. 28, May, pp. 525-527. (References.)

Grant, H. W. Some observations on divergent strabismus with anomalous retinal correspondence. *Amer. Jour. Ophth.*, 1945, v. 28, May, pp. 472-485; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42. (One table, references.)

Loewenthal, L. J. A. Partial albinism and nystagmus in Negroes. *Arch. Derm. and Syph.*, 1944, v. 50, Nov., p. 300.

Two cases are presented of partial albinism in Negroes. One was a red Negro and the other a yellow Negro. In both cases poor vision and nystagmus were present. That the nystagmus of albinos is not caused by gross deficiency of pigment in the eye is shown by these two Negroes whose ocular pigment was equivalent to that of a European brunet.

Robert N. Shaffer.

Pemberton, E. C. Prognosis of post-operative diplopia in adults. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 370-374.

The possibility of diplopia in an adult following surgical procedures on the ocular muscles can be anticipated by the objective findings with the major amblyoscope. That diplopia should be elicited before any operation, and the impression should be conveyed to the patient that diplopia is a desirable achievement and that, when perceived, fusion training will cause it to disappear.

The patient may be able to cope with simultaneous perception slides, that is he can see the lion in the cage, but yet may fail to fuse two similar slides. This means that although he is capable of simultaneous perception he is unlikely ever to be able to blend the images seen with the two eyes. With such patients there is risk of probably constant diplopia following operation.

If the patient possesses the capacity for fusion he has an excellent chance of single binocular vision after surgical straightening.

In patients with abnormal retinal correspondence who are operated upon before false projection is eradicated, one of two things is likely to happen: either the projection quickly becomes

true or the condition reverts to the old deviation. Beulah Cushman.

Stewart, D. D. S. Some observations on a tendency to near-point esophoria, and possible contributory factors. *Brit. Jour. Ophth.*, 1945, v. 29, Jan., pp. 37-42.

A series of experiments is reported which bears out the author's opinion that the comfortable binocular performance of sustained close work is associated with an appropriate eye-muscle balance at the working distance, which can be defined as some degree of exophoria in the presence of a power of voluntary convergence and especially of relative convergence, ample to overcome that exophoria. Previous experience had led the author to believe that two or more diopters of exophoria represented the normal near-point muscle-balance at 33 cm., with orthophoria as an upper "safety" limit of comfort.

Examinations of the near-point muscle-balance of 73 men, before and after half an hour's critical test of stereoscopic sense, showed an increase in esophoria from 8.5 percent to 30 percent. The average exophoria in the resting state was 2.3 diopters of exophoria with 60 percent within normal range. After the test, the average exophoria had dropped to 1 diopter and the number within normal range was only 42 percent. Edna M. Reynolds.

## 5

### CONJUNCTIVA

Castañó Decoud, D. D'A. de. Histopathologic study of conjunctival pemphigus. *Anales Argentinos de Oft.*, 1944, v. 5, April-May-June, pp. 44-49.

Relatively few such studies have been made. The author used specimens of tarsal, fornix, and bulbar conjunc-

tiva from an established case of common pemphigus. The bulbar conjunctiva showed vacuolar degeneration of the epithelium, edema, numerous new-formed blood vessels, and plasmolymphocytic infiltration. Cellular regeneration and transition were also present. In certain zones there were three or more layers of kerato-hyalinization. The tarsal conjunctiva revealed collagen and cystic formations similar to sebaceous glands. Cell rests, sebaceous degeneration, cytoplasmic granulomas, giant cells, and lymphocytic accumulations were also present. The palpebral conjunctiva yielded a small band of intracellular edema, new-vessel formation, fixed cell proliferation, patches of atrophy, dilated glands and endocanalicular proliferation, and intense interstitial lymphoplasmocytic infiltration. The overall picture is one of epidermal hyperplasia and metaplasia, and new-vessel formation. (6 illustrations.) Edward Saskin.

Castillo, J. L. A case of syphilis of the conjunctiva. *Arch. de Oft. de Buenos Aires*, 1943, v. 18, March, p. 165.

A girl aged ten years had been complaining for the previous six months of lacrimation and discharge from both eyes. Upon examination bilateral trachoma and a small conjunctival tumor of the left eye were found. This tumor invaded the nasal portion of the bulbar conjunctiva, reaching the upper and lower fornices and the corneal limbus, which it slightly overlapped. The mass was red and painless and gave the impression of a flat papilloma. There were no preauricular or submaxillary glands. The blood serology was negative, while the tuberculin intradermal test was intensely positive and the chest X rays showed evidence of hilar tuberculosis.

In view of these findings a tentative diagnosis of conjunctival tuberculosis was made. A biopsy, however, showed the histopathologic picture of an infectious granuloma. Before proceeding to animal inoculation a provocative Kahn test was made out with a positive result. Under antiluetic therapy the tumor mass entirely disappeared and the bulbar conjunctiva regained a nearly normal aspect. In view of this favorable evolution the author considered experimental inoculation unnecessary and in the absence of regional adenopathy he concluded that the tumor represented a syphilitic granuloma of the conjunctiva of probable hereditary origin. (Illustrations, bibliography.) Plinio Montalván.

Elles, N. B. Amyloid disease of the conjunctiva. *Amer. Jour. Ophth.*, 1945, v. 28, May, pp. 486-497; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42. (3 figures, bibliography.)

McCulloch, R. J. P., and Dyson, C. Gonococcal conjunctivitis treated with penicillin. *Canadian Med. Assoc. Jour.*, 1945, v. 52, March, p. 284.

This is a case report of Neisserian conjunctivitis resistant to 11 days treatment with oral and local sulfathiazole, but which cleared culturally within five days after penicillin therapy consisting of 120,000 units per day intravenously for two days; with further use of hourly topical application of penicillin to the conjunctivas in concentration of 1000 units per c.c. continued for 12 days.

Owen C. Dickson.

Miller, M. E. Gonorrheal ophthalmia. *Jour. Indiana State Med. Assoc.*, 1944, v. 37, Dec., p. 679.

Definite conclusions as to the complete effectiveness of penicillin therapy

in the treatment of gonorrheal ophthalmia will require a large series of cases and more detailed study. However, in the case reported, a definite clinical response was rapidly obtained. The profuse purulent exudate was markedly decreased within 48 hours and completely eliminated within five days. An eye culture obtained on the eighth day of hospitalization was negative, as was each subsequent culture. It is also significant that this case and the case reported by Griffey each retained 20/20 vision in the affected eye at the close of treatment. Penicillin offers a promising future in the management of gonorrheal ophthalmia. But until much more experience is gained, we must accept with caution the results of this and other cases.

Theodore M. Sharpira.

Paëz Allende, Francisco. Diffuse neurofibromatosis (Recklinghausen's disease) involving the bulbar conjunctiva. *Arch. of Ophth.*, 1945, v. 33, Feb., pp. 110-115.

Neurofibromatosis involving the eyelids, the optic nerve, the orbit, the retina, the iris, the cornea, and the tarsal conjunctiva have been described. Involvement of the bulbar conjunctiva is very rare, only three cases having been reported.

The author reports the case of an 18-year-old twin girl, with a large neurofibroma of the bulbar conjunctiva of the right eye. She also presented asymmetry of the body, cutaneous tumors, partial alopecia of the scalp on the side of the affected eye, skeletal lesions, intracranial involvement, and epilepsy. All of the lesions were congenital. Detailed accounts of the gross physical findings and of microscopic findings in biopsy tissue are given. (7 illustrations, references.)

John C. Long.

Sievers, J. J., Knott, L. W., and Soloway, H. M. Penicillin in the treatment of ophthalmia neonatorum. *Jour. Amer. Med. Assoc.*, 1944, v. 125, July 8, p. 690.

Eight cases of ophthalmia neonatorum were treated with intramuscular injections of penicillin in total dosages varying from 60,000 to 330,000 units. Seven of the eight were almost certainly due to gonorrhea. Six of the seven made prompt responses to penicillin in 24 hours and complete recovery within three to six days. One of the definite cases of gonorrhea proved to be penicillin-resistant. The eighth case was also resistant and smears and cultures failed at any time to reveal a significant organism. In all cases the penicillin was at first given intramuscularly every three hours for six injections, then increased as necessary for the individual case.

Robert N. Shaffer.

Sorsby, Arnold. The treatment of trachoma with special reference to local sulfonamide therapy. *Brit. Jour. Ophth.*, 1945, v. 29, Feb., pp. 98-102.

A series of 200 patients treated under ideal conditions for continuous observation is reported. A standardized management of trachoma has been worked out. The only medicines found helpful before the advent of the sulfonamides were saturated solution of quinine bisulphate, mercury perchloride, and trachocid. Saturated solution of quinine contains about 2 percent of the salt in solution. Mercury perchloride is generally used as a paint—0.5 to 2-percent solution in glycerine. Trachocid is a proprietary preparation said to be bee venom manufactured by the State Serum Institute at Vienna. It is injected into the upper fornix and subconjunctivally at the limbus.

A simple classification based on

therapeutic requirements was used. Stage I was active trachoma with sodden fornices and follicle formation. Stage II indicated a moist tarsal conjunctiva without follicle formation and little swelling of the fornix. Stage III was the same as Stage II but with the conjunctiva no longer moist—in the process of healing. Treatment was aimed at the rapid conversion of Stage I into Stage II. The passage of Stage II to Stage III was slower.

Sulfonamides were used first by oral administration and later by local application. Using this in conjunction with other agents, trachoma can now be rendered noninfectious within three months and can be clinically cured in six months.

By the use of the following treatment Stage I can be converted into Stage II in a fortnight: (1) administration of full doses of sulfapyridine, sulfathiazole, or sulphamezathine for 10 days; (2) mechanical expression of the follicles and the fornix, repeated if necessary after 7 or 14 days; (3) painting the conjunctival surface, immediately after expression, with saturated solution of quinine and repeating this three times daily for 7 to 14 days.

During Stage I, the application of copper must be rigorously avoided. In Stage III, no treatment is necessary although there is no harm in using copper sulphate or zinc sulphate 0.25 percent. Sulfacetamide ointment is helpful also in securing adequate treatment with minimal scarring.

Pannus regresses with proper management of the conjunctival lesion. Massage with a smooth glass rod once daily is a useful procedure, especially in Stage II. Atropine is of course indicated in active corneal lesions. Carbolicizing with a 30-percent sulfacetamide solution is indicated with corneal

ulcers. The copper stick is a barbarous procedure and should be discarded. Copper has no place in the modern treatment of trachoma. When applied, it does untold damage to a moist eye and makes a dry eye moist.

There is no theoretical reason for doubting the specificity of the sulfonamides against the unisolated trachoma virus.

—Edna M. Reynolds.

Sorsby, A., and Hoffa, E. E. Choice of sulphonamide in the treatment of ophthalmia neonatorum. *Brit. Jour. Ophth.*, 1945, v. 29, March, p. 141.

A series of 333 cases of ophthalmia neonatorum which were treated with various sulfonamides is reported. Sulfanilamide was soon discarded because it was not well tolerated, although its therapeutic effects were satisfactory. Accepting a clinical cure within eight days as a satisfactory result, sulfapyridine and sulfamezathine gave almost identical percentages of successes—viz., 82.7 percent and 83.3 percent respectively. Sulfamezathine gave a larger percentage of successful results within three days than sulfapyridine.

Gonococcal ophthalmia showed more cures within a three-day period with sulfapyridine, sulfamezathine and sulfathiazole than cases of ophthalmia neonatorum due to other organisms. The choice of a sulfonamide in the treatment of ophthalmia neonatorum lies between sulfamezathine, sulfathiazole, and sulfadiazine. Whichever sulfonamide was used, there was a residue of cases that did not do well. About 17 percent of the cases either required treatment for more than eight days or showed relapses, poor response, or intolerance. Although sulfamezathine was well tolerated, a larger proportion of cases showed poor response with this drug. Some 30 to 40 percent of

cases showed clinical cure within three days. Well over 80 percent were cured at the end of eight days treatment. Cases with inclusion bodies responded favorably to sulfonamides. Severe infections cleared as rapidly as milder ones, and there were no serious local complications in the series. (One figure, 2 tables, references.)

Edna M. Reynolds.

Victoria, V. A., and Artigas, M. Sulfonamide therapy in trachoma. Arch. de Oft. de Buenos Aires, 1943, v. 18, March, p. 155.

From a study of 26 cases of trachoma treated with sulfonamides, the authors arrive at the following conclusions: The local use of sulfonamides is indicated in all cases of trachoma, the collyrium form being preferable to all others because of its convenience in administration. Local application of the drug has the same beneficial action as oral administration, without the risk of intolerance. While this treatment is important, it cannot be considered the only form of medication.

Plinio Montalván.

Vorisek, E. A., and Evans, A. L. Penicillin administered locally in gonorrheal ophthalmia. Amer. Jour. Ophth., 1945, v. 28, May, pp. 520-523. (References.)

Weskamp, C., and Vila Ortiz, J. M. Tuberculosis of the conjunctiva. Ulcerovegetative form. Anales Argentinos de Oft., 1944, v. 5, April-May-June, pp. 39-43.

An 18-year-old male complained for some months of a thickening and redness of the right upper lid, and preauricular swelling. Eversion of the upper lid showed a thickened conjunctiva, papillomatous upper tarsal border,

and red sessile conjunctival growths with ulceration. The right lower lid was practically normal and the left eye was completely negative. Microscopic study of a piece of affected tissue showed characteristics of tubercle. The Mantoux test was positive in 1 to 1000 concentration. The authors feel that a primary conjunctival lesion is not improbable, in view of negative intrathoracic findings. (2 illustrations.)

Edward Saskin.

## 6

### CORNEA AND SCLERA

Anquín, M. H. Groenouw's keratitis. Arch. de Oft. de Buenos Aires, 1943, v. 18, Jan., p. 25.

Seven cases of Groenouw's corneal dystrophy are reported. The interesting features of these cases are that the disease appears as a dominant mendelian character and the cases show moderately elevated blood cholesterol. The article is illustrated.

Plinio Montalván.

Chamberlain, W. P., and Bronson, L. H. Herpes-simplex keratitis in malaria. Arch. of Ophth., 1945, v. 33, March, pp. 177-183.

During recent months increasing numbers of otherwise healthy troops have contracted malaria in tropical combat areas. In these patients numerous instances of keratitis due to herpes-simplex virus have been encountered. The most common corneal lesion of herpes simplex is an epithelial infection which is usually seen as an irregular linear ulceration with characteristic dendritic contour. Multiple discrete superficial punctate lesions may be found alone or simultaneously with a dendritic ulcer. Deep keratitis may develop from a preëxisting superficial le-



sion or may appear as a disciform keratitis involving primarily the corneal parenchyma. A disturbing feature is the recurrence of small rounded meta-herpetic ulcers. Corneal hypesthesia is characteristic of all these manifestations. Instances of every variety of herpes-simplex keratitis have been encountered in patients with recurrent malarial attacks, but this paper is chiefly concerned with superficial dendritic keratitis. A review of the literature on ocular complications of malaria is given.

The new patients examined in the clinic during an 18-month period fall into two comparable groups. The first had been in a malarial district under combat conditions for four months and had a malarial incidence of about 80 percent, but the patients were otherwise in good physical condition. The second was composed of troops free from malaria. The two divisions lived under similar camp conditions in an area where minor infections of the respiratory tract are common but primary infection with malaria is unknown.

The incidence of dendritic keratitis in the malarial group was one in every 188 new patients examined in the ophthalmologic clinic, whereas among patients not exposed to malaria the incidence was one in every 1,100 patients. Only a fraction of 1 percent of patients admitted to the hospital with malaria ever contracted herpetic keratitis.

Through impairment of vision and prolonged irritation, herpes-simplex keratitis was more disposed to limit duty of patients at their station than any other single eye condition. Sulfadiazine powder applied locally to five dendritic ulcers seemed to promote rapid healing. In four cases of atypical

recurrent herpetic ulcers sulfadiazine was of no demonstrable benefit. From the cornea of each of two patients with recurrent malarial attacks and dendritic keratitis the causative agent was transferred to a rabbit's cornea and thence to the chorioallantoic membrane of a chick embryo, where characteristic lesions of herpes-simplex virus were produced.

Skin tests for sensitivity to herpes-simplex-antigen-positive responses were obtained in about 80 percent of a group of hospitalized adult patients, and there was no appreciable difference in incidence between malarial and non-malarial patients. (2 tables, 10 case reports, references.) R. W. Danielson.

Cogan, D. G. Syndrome of non-syphilitic interstitial keratitis and vestibuloauditory symptoms. *Arch. of Ophth.*, 1945, v. 33, Feb., pp. 144-149.

A clinical syndrome consisting of interstitial keratitis associated with vertigo, tinnitus, and usually profound deafness has been described from one case by Morgan and Baumgartner. The author has recently observed four cases of this condition which he describes in detail.

Three of the patients were young women whose presenting complaints were severe vertigo, tinnitus, progressive bilateral deafness, pain in both eyes, ciliary injection, photophobia, and somewhat reduced vision. Examination showed nerve-type deafness with absence of labyrinthine function, and deep keratitis of each eye characterized by patchy infiltration of the deep corneal stroma, with little reaction in the anterior chamber and iris. The vertigo was sufficiently severe to confine the patient to bed for several weeks. In all cases the course of the illness was characteristically chronic.

The fourth case differed from the other three in that the patient was a man, the vestibuloauditory symptoms were relatively mild, the deafness temporary, and the keratitis limited to one eye. All of the patients are still under observation, and in none of them is the disease now inactive.

No cause has been discovered for this syndrome. Thorough studies for syphilis have given negative results. Similarly, there has been no indication of tuberculosis, mumps, influenza, herpes zoster, or other known agent of keratitis. (2 illustrations.)

John C. Long.

Colé, W. T. S., Hamilton-Paterson, J. L., and Sorsby, A. The suitability of experimental corneal lesions for evaluating local sulphonamide therapy. *Brit. Jour. Ophth.*, 1945, v. 29, March, pp. 150-155. (See Section 2, Therapeutics and operations.)

Devlin, P. J. A case of interstitial keratitis at an early age. *Brit. Jour. Ophth.*, 1945, v. 29, March, pp. 155-156.

A case in a child of 15 months is reported because of the rarity of the disease under five years of age.

Edna M. Reynolds.

Green, M. I. A simple technique for corneal transplantation. *Arch. of Ophth.*, 1945, v. 33, Feb., pp. 150-152.

The technique is as follows: The area to be grafted is outlined with a 4.1-mm. trephine blade and the area stained with fluorescein. An intracorneal stitch is then inserted in a pattern outside of the circle outlined by the trephine. This stitch is so placed that when tightened it makes a cross covering the graft. A 4-mm. blade is then inserted into Green's automatic trephine and a trephine button cut from the donor cornea.

A 4.1-mm. blade is substituted and a hole of this size is trephined in the recipient cornea within the circle previously outlined with fluorescein. The graft is then gently inserted into the defect and the suture drawn tight and tied. There is sufficient swelling to produce close contact between the graft and the host tissue. (5 figures.)

John C. Long.

Meyran, Jorge. A case of Stähli's line. *Bol. del Hosp. Oft. de Ntra. Sra. de la Luz*, 1944, v. 2, Jan.-June, pp. 161-162.

The patient was a man of twenty years who came complaining of slowly developing blurred vision in the right eye. He had suffered from malaria and frequent respiratory disturbances, but had no history of lues or rheumatism. There was moderate conjunctival and ciliary injection. Between the middle and lower thirds of the cornea was a thin greenish-yellow line running horizontally, slightly wavy, with three or four small ramifications, and taking at each end the form of a fan. The iris had lost its outlines, and had the appearance of blotting paper. Almost the whole pupillary border was adherent to the lens capsule. There was a fine punctate disturbance of the whole cornea, and the lens showed a complicated cataract. In spite of a negative Wassermann, the treatment consisted of 15 injections of cyanide of mercury and 13 series of four injections each of very weak doses of tuberculin, with atropine and dionin locally. The patient gained weight, but the further course of the condition is not otherwise recorded.

W. H. Crisp.

Rocha, Hilton. Considerations regarding keratoconus. *Rev. Brasileira de Oft.*, 1945, v. 3, March, pp. 123-135.

The author tabulates 20 cases (13

feminine and 15 binocular) according to various metabolic and other considerations: in table one as to heredity, weight, gastrointestinal condition, and so on; in table two as to chemical findings, blood reactions, condition of sella turcica, basal metabolism, and so on; and in table three as to hyperthyroidism and some related data.

W. H. Crisp.

## 7

### UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Clapp, C. A. Diabetic iridopathy. *Amer. Jour. Ophth.*, 1945, v. 28, June, pp. 617-623; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42, p. 280. (8 illustrations, references.)

Coscarelli, Ennio. Retrocorneal hyaline membranes. *Ophthalmos*, 1944, v. 3, no. 3, pp. 345-350.

The condition was seen in a young man of 18 years, whose history indicated that he had always had white spots in the right eye. This eye deviated inward and upward, and showed limitation of abduction. Descemet's membrane and the epithelium were not involved. There was a central opacity in the anterior part of the corneal parenchyma. Downward and inward from this opacity, and also at the upper outer angle, were seen opaque "promontories," sometimes whitish but frequently brown almost like the iris tissue. These promontories appeared at certain points to be attached to the lesser circle of the iris, but generally were directed toward the angle of the anterior chamber. Miosis with pilocarpine showed the pupillary sphincter to be normal throughout its circumference. In contact with the posterior surface of the cornea were iris fibers

alternating with the whitish hyaline membrane. (One color plate.)

W. H. Crisp.

Farnell, F. J. The syndrome of Adie: an entity or a projected syndrome? *Urologic and Cutaneous Review*, 1944, v. 48, Dec., p. 616.

The author presents a case, and discusses the important factors which differentiate this condition from syphilis.

Francis M. Crage.

Fralick, F. B., Rubeosis iridis diabetica. *Trans. Amer. Ophth. Soc.*, 1944, v. 42, pp. 436-456. (See *Amer. Jour. Ophth.*, 1945, v. 28; Feb., p. 123.)

Gellhorn, E., and Levin, J. The nature of pupillary dilatation in anoxia. *Amer. Jour. Physiology*, 1945, v. 143, Feb., p. 262.

Anoxia, produced by lowering the barometric pressure, and asphyxia, created by clamping the trachea, induce pupillary dilatation in cats, including maximal dilatation. This phenomenon is reversible if artificial respiration is maintained. The sympathectomized pupil behaves like the normal on decreasing barometric pressure, but while the pressure is being normalized the normal pupil remains slightly more dilated than the sympathectomized pupil, signifying that the sympathetic system influences the pupil only on account of its tone. As long as the constrictor is strong, as is the case at sea level, the sympathetic exerts no influence on the pupil, but when the tone of the third nerve becomes diminished with decrease of barometric pressure the sympathetic has an increasing influence. Adrenalectomy has no influence on the behavior of the normal or sympathectomized

pupil. A completely denervated pupil does not dilate in anoxia or asphyxia. These experiments, the author points out, show that neither sympathetic excitation nor the secretion of adrenal-in plays a role in the dilatation of the pupil seen in anoxia or asphyxia. The authors further analyze physiologic dilatation of the pupil. It consists of a neural and a non-neural component. The former is due to diminution in tone of the third nerve center, the latter is probably associated with the formation of acid metabolites.

R. Grunfeld.

Meyran, Jorge, A case of Stähli's line. *Bol. del Hosp. Oft. de Ntra. Sra. de la Luz*, 1944, v. 2, Jan.-June, pp. 161-162. (See Section 6, Cornea and sclera.)

Patwardhan, D. G. A case of endophthalmitis. *Indian Jour. Ophth.*, 1945, v. 6, Jan., p. 1.

The patient, a man of 53 years, had been operated upon for acute glaucoma five years previously, retaining vision of 6/9 with correction. During an attack of uveitis, and after paracentesis and the usual medicinal treatment, there was evidence of exudate in the vitreous, as well as in the anterior chamber, and vision was reduced to hand movements. Local and general use of sulfonamides led to recovery with vision of 6/24 after a month.

W. H. Crisp.

Perera, C. A. Sympathetic ophthalmia following subconjunctival rupture of the eyeball. *Amer. Jour. Ophth.*, 1945, v. 28, June, pp. 581-595; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42, p. 525.

Ramírez González, Armando. Heerfordt syndrome. *Anales de la Soc.*

*Mexicana de Oft. etc.*, 1944, v. 19, Jan.-June, pp. 28-33.

A single case is described, in a woman aged 23 years. Pain, beginning in the right eyeball, increased in intensity and radiated to involve the face, the parotid region, and the base of the tongue. Next day the patient had a chill and a temperature slightly over 102 degrees. The symptoms varied in the course of ten days, with occasional sweats and with abundant salivation. There was tenderness in the region of the lacrimal and parotid glands. The eyelids were swollen, and marked symptoms of uveitis developed in the left eye. (2 photographs, references.)

W. H. Crisp.

Randolph, M. E. Sympathetic ophthalmia. *Bull. U. S. Army Med. Dept.*, 1944, Dec., p. 49.

The author favors early enucleation of hopelessly lost eyes. When the disease is established, whether or not enucleation has been performed, non-specific protein therapy should be used in a course of triple typhoid vaccine, starting with 25 million and increasing by 10 million per dose every three days for at least eight injections. Sodium salicylate starting with 200 to 250 grains per day should be given excepting during the foreign protein administration. Treatment should be continued for at least a month after the disease has been brought under control. Up to date, sulfonamides and penicillin have shown no effect on the course of the disease.

Frances M. Crag.

Rosenbaum, J. Voluntary pupillary movements. *Amer. Jour. Ophth.*, 1945, v. 28, May, pp. 523-525. (References.)

Silveira, Oswaldo. Iridocyclitis and

infected varicose ulcer. *Ophthalmos*, 1944, v. 3, no. 3, pp. 284-286.

In a man of 56 years, attacks of iridocyclitis were apparently due to an extensive leg ulcer which for four years had defied treatment. During one of these attacks the patient asked whether there might not be a connection between the eye condition and the leg ulcer. He was therefore subjected to extensive resection of the superficial veins of the leg. The eye recovered, and the patient returned for observation several times during the next 16 months, without further attacks.

W. H. Crisp.

## 8

### GLAUCOMA AND OCULAR TENSION

Allen, T. D. Congenital glaucoma and cataract, bilateral; goniotomy and needling. *Trans. Amer. Ophth. Soc.*, 1944, v. 42, pp. 308-314. (See *Amer. Jour. Ophth.*, 1945, v. 28, April, p. 388.)

Graue, Enrique, Jr. Hemicyclodialysis and its treatment in chronic simple glaucoma. *Bol. del Hosp. Oft. de Ntra. Sra. de la Luz*, 1942, v. 2, Sept.-Dec., pp. 51-58.

Apparently the most frequent operation for chronic simple glaucoma in the Mexican Republic is cyclodialysis extended to include one half of the ciliary body. Torres Estrada, as quoted by the author, has designed a special angular spatula, with rounded edges, and grooved on both faces, the purpose of the grooves being to prevent sudden

escape of the aqueous upon withdrawal of the instrument. This extended type of cyclodialysis is said to show a decidedly higher percentage of successful results. The operation is not indicated in acute glaucoma. W. H. Crisp.

Natale, Amadeo. Bases of antiglaucomatous operations. *Arch. de Oft. de Buenos Aires*, 1943, v. 18, Jan., p. 1.

The author discusses the factors which predispose to glaucoma and as the main underlying cause he emphasizes circulatory disturbances of the eye brought about by angioneurosis and sclerosis. The probable mechanism of drainage of the intraocular fluids is also discussed. Microgonioscopy has proved a very valuable method of clinical examination. The author groups glaucoma into two main types, one with deep anterior chamber and open filtration angle and the other with shallow anterior chamber and obliterated filtration angle. On the basis of this clinical approach, a particular type of operation is chosen. The author discusses in detail the indications and contraindications for iridectomy, corneoscleral trephining, Lagrange sclerectomy, cyclodialysis, Barkan's goniotomy, and cyclodiathermic puncture. He also stresses the importance of instructing the patient concerning the disease, in order to obtain his coöperation and bring him to early operation when this is indicated. (Photomicrographs, bibliography.)

Plinio Montalván.

# PAN-AMERICAN NOTES

Edited by DR. M. URIBE TRONCOSO  
500 West End Avenue, New York 24

Communication should reach the Editor by the twelfth of the month

*2d Pan-American Congress of Ophthalmology.* At a meeting held in Buenos Aires by the Committee of Arrangements, the following program for the forthcoming meeting of the Pan-American Congress of Ophthalmology, which will convene in November of this year in Montevideo, was approved.

November 26th, Monday, in the morning: "Inaugural Session; in the afternoon, "Social ophthalmology," report of the Committee for the Prevention of Blindness of the Pan-American Congress of Ophthalmology, of which Dr. Francisco Belgeri of Buenos Aires is the president.

November 27, Tuesday, in the morning: "Contact lenses" by Prof. Baudilio Courtis, and "Gonioscopy and gonimetry" by Dr. N. S. Sugar; in the afternoon: "Preglaucomatous state. Diagnosis and treatment" by Dr. Frederick Cordes; "New view points on glaucoma derived from gonioscopy" by Dr. Peter Kronfeld.

November 28th, Wednesday, in the morning: "Estimation and mechanism of the destructive effects of ocular hypertension" by Dr. Amadeo Natale; "Opportunity of surgical intervention in glaucoma: Up to what point can medical treatment be continued?" by Prof. Hilton Rocha; in the afternoon: "Social ophthalmology," report on Trachoma by the Committee on Trachoma of the Pan-American Congress of Ophthalmology—President, Prof. Ivo Correa Meyer.

November 29th, Thursday, in the morning: Papers on Research in ophthalmology; in the afternoon: Business meeting.

November 30th, Friday, in the morning: "Surgical treatment of heterophorias" by Dr. G. P. Guibor and "Surgical treatment of heterotropias" by Dr. Thomas Allen.

December 1st, Saturday, Closing session.

Papers to be presented to the Congress, together with an abstract not exceeding 750 words, should be in the hands of the Executive Committee before August 15, 1945. The papers will be translated into the other official languages of the Congress and projected on the screen during the reading by the authors.

A Scientific and a Commercial Exhibition will be held at the time of the meeting of the Congress. The registration fee for members is \$20.00 (Uruguay money) and \$10.00 for persons in the member's family. The fee should be sent to the Committee before October 1st, at which time the registrations to the Congress will be closed.

All American Ophthalmologists are invited

to participate in this Congress. Address all communications to Dr. A. Vazquez-Barriere, Montevideo, Uruguay, or to the executive secretary Dr. Conrad Brens, New York, U.S.A.

Despite war-time restrictions, it is still possible for a limited number of North American ophthalmologists to obtain transportation to Montevideo. Arrangements can be made through the American Express Company and the Pan American Airways.

## SOCIETIES

*Brazil.* At a meeting on April 7th at the São Geraldo Hospital, the following officers were elected by the Sociedade de Oftalmologia de Minas Geraes for the fiscal year 1945-1946: president, Dr. Geraldo Queiroga, vice-president, Dr. Amelio Bonfili; secretary, Dr. Guilherme Fonseca; and treasurer, Dr. Helio Faria.

The Sociedade de Oftalmologia de São Paulo elected the following officers for the year 1945-1946: president, Dr. Silvio de Almeida Toledo; vice-president, Dr. Penido Burnier Filho; general secretary, Dr. Plinio Toledo Pinza; secretary, Dr. Moacir Cunha; treasurer, Dr. Aureliano Fonseca; and filing, Dr. Orlando Aprigliano.

## PERSONALS

*Dr. Harry Gradle's visit to Lima.* Dr. Gradle arrived in Lima on January 3, 1945. A dinner was offered to him at the home of Prof. Jorge Valdeavellano. The Ambassador of the U.S.A. in Peru, the dean of the Medical College, the president of the Society of Ophthalmology and Otolaryngology, and some Peruvian ophthalmologists were also present. The next day Dr. Gradle lectured before the Society of Ophthalmology and Otolaryngology on "The development of an ophthalmologist." Addresses of welcome were made by the president of the Society, Dr. Juvenal Denegri and by Dr. J. Valdeavellano. At this meeting Dr. Gradle was made an Honorary Member of the Society. After the meeting, the Society and a few members of the American College of Surgeons resident in Lima gave a dinner for Dr. Gradle at the Club Nacional. A toast was proposed by Dr. Denegri to which Dr. Gradle replied with a few well-chosen words.

*Dr. Daniel B. Kirby in Mexico.* Dr. D. B. Kirby gave a course in operative technique with lectures and demonstration of operations which lasted for one week. Cataract, glaucoma operations, ptosis, strabismus, and others were

included in his program. The Mexican Ophthalmological Society and the University of Mexico sponsored the course. In recognition of his teaching work the University of Mexico appointed him Extraordinary Professor of Ophthalmology.

Dr. Manuel Uribe Troncoso has been nominated Honorary President of the Mexican Society of Ophthalmology and Otolaryngology at the January, 1945, meeting of the association.

Dr. Alberto Urrets Zavalía, Professor of Ophthalmology at the University of Córdoba, Argentina, has been visiting the hospitals and clinics in the United States. He was in Chicago, where he attended Dr. Kronfeld's Clinic and also in New York, where he assisted in the Eye Clinic at the Medical Center. He was interested in gonioscopy and had demonstrations of the method in some patients with Dr. Uribe Troncoso.

## NEWS ITEMS

Edited by DR. DONALD J. LYLE  
904 Carew Tower, Cincinnati 2

News items should reach the editor by the twelfth of the month.

### DEATHS

Dr. William C. Byers, Webster, Pennsylvania, died April 28, 1945, aged 74 years.

Dr. Jesse H. Campbell, Commerce, Georgia, died April 14, 1945, aged 54 years.

Dr. Charles E. Coleman, Belleville, Illinois, died April 8, 1945, aged 73 years.

Dr. Frances Dickinson, Chicago, Illinois, died May 19, 1945, aged 89 years.

Dr. Joseph R. Gaines, Las Animas, Colorado, died April 30, 1945, aged 79 years.

Dr. William P. Greening, Pauls Valley, Oklahoma, died March 2, 1945, aged 69 years.

Dr. John T. Herron, Jackson, Tennessee, died April 21, 1945, aged 85 years.

Dr. Charles S. Hunter, West Sunbury, Pennsylvania, died April 5, 1945, aged 69 years.

Dr. David H. Ludlow, Easton, Pennsylvania, died April 13, 1945, aged 87 years.

Dr. Wright C. Williams, Peoria, Illinois, died May 12, 1945, aged 64 years.

### MISCELLANEOUS

The University of Rochester School of Medicine and Dentistry, Rochester, New York, conducted the thirteenth summer graduate course in ophthalmology from July 30th to August 2d. The following guest lecturers participated: Dr. Paul A. Chandler, Dr. Glen G. Gibson, Dr. Daniel B. Kirby, Dr. Donald J. Lyle, Dr. Raymond L. Pfeiffer, Dr. Theodore L. Terry, Dr. Joseph Tiffin, Mr. Scott Sterling, Mr. Frederick W. Jobe, and Mr. Irving Lueck.

The Meritorious Service Unit Plaque has been awarded to the Old Farms Convalescent Hospital (Special) at Avon, Connecticut, for its work with the blinded soldiers. The presentation was made by Major General Norman T. Kirk, Surgeon General of the Army, who said, "The Old Farms Convalescent Hospital (Special), first established in June, 1944, quickly de-

veloped into an institution unique in its kind in the country, even in the world. Ably administered, the institution has taken over the important problem of social adjustment of the blinded soldier, and in these relatively few months, has succeeded in its purpose admirably."

### SOCIETIES

The new officers of the New York Society for Clinical Ophthalmology for 1945-46 are: Dr. Maurice L. Wieselthier, president; Lt. Comdr. B. Friedman, vice-president; Dr. Leon Ehrlich, recording secretary; Dr. Benjamin Esterman, corresponding secretary; and Dr. Daniel Kravitz, treasurer. Meetings will be held on the first Monday of each month from October through May at the New York Academy of Medicine, 2 East 103d Street, New York City.

### PERSONALS

On June 3, 1945, Colby College, Waterville, Maine, awarded the honorary degree of D.Sc. to Hermann M. Burian, M.D., Ophthalmologist in Chief, Dartmouth Eye Institute, Hanover, New Hampshire. The citation of Colby College read as follows:

"HERMANN MARTIN BURIAN, son of a well-known professor of physiology, student of languages, literature, and music, as well as science, educated in the most renowned laboratories of the old world, you have won a distinguished place in the new. In the field of ocular motility and binocular vision your work has received the praise of those of your colleagues whose judgment is most to be esteemed and you are already hailed as one of the builders of American ophthalmology."

Dr. William J. Harrison, of Philadelphia, read a paper on "Ocular therapeutics before the Reading Eye, Ear, Nose and Throat Society on June 20, 1945.

# AMERICAN JOURNAL OF OPHTHALMOLOGY

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CONCERNING THE SIMILARITY OF THE DEVELOPING RETINA  
AND BRAIN WALL IN HUMAN EMBRYOS\*

HENRY C. HADEN, M.D.

*Houston, Texas*

We see as we think, unconsciously. The moment that we become conscious that we are seeing or thinking, something is wrong. Descartes's celebrated proposition, "Cogito ergo sum," I think, therefore I am, may well be paraphrased by saying, "Cogito ergo video," I think, therefore I see.

The function of vision differs from that of all other organs of special sense, the reason for which is that the retina is a modified part of the brain and that the optic nerve is a brain tract connecting it with another part of the brain. Furthermore, the retina is not derived directly from the surface ectoderm as are the other organs of special sense but has its origin in the primordium of the central nervous system.<sup>1,2</sup> The cells from which the retina is to form are in the ectoderm, which folds in to form the neural tube. After the anterior end of the neural tube has expanded into the anterior cerebral vesicle, the portion of the wall containing these cells grows out, or evaginates, and the optic vesicles are formed (fig. 1). Shortly after the optic evaginations occur a dorso-lateral swelling appears in the telencephalon, the anterior division of the anterior cerebral vesicle (fig. 2). This swelling is the pallium, or mantle, from which the lobes of the brain develop.<sup>3</sup> It is with the wall of the anterior part of

the pallium that the comparisons with the developing retina are to be made, for the part of the cerebral-vesicle wall from which the optic vesicles evaginated becomes part of the floor of the brain (fig. 2).

At the 4 mm. age (fig. 2) the walls of the cerebral vesicle and of the optic vesicles are composed of a dense mass of undifferentiated epithelial cells. After the optic vesicles invaginate they show a marked change (fig. 3). In the inner wall of the optic cup the cells become arranged in a nuclear layer, or zone, on its outer side—that is, toward the lumen of the optic vesicle—and its inner portion becomes acellular. The outer zone, the one adjacent to the original lumen of the optic vesicle, is the nuclear zone, and the acellular, or inner layer, the one adjacent to the vitreous chamber, is the marginal zone. In the brain wall (fig. 3) the inner portion, that adjacent to the ventricle, is densely nucleated and is called the ependymal zone, or matrix. The outer portion of the wall is acellular and is called the marginal zone.

The wall of the brain is continuous with the wall of the optic cup, and its cavity is in continuity with the residual lumen of the optic vesicle through the lumen of the optic stalk. When the optic vesicle invaginates the invagination is carried along the ventral wall of the stalk (fig. 4), so that the marginal zone of the

\* Presented before the St. Louis Ophthalmic Society, January 26, 1945.

optic cup is directly continuous with that of the brain wall through the medium of the fetal fissure. The cells in the nuclear zone of the optic cup and in the ependymal zone of the brain wall proliferate and migrate into the marginal layer or zone.<sup>2</sup> In this fashion the different layers or zones of both retina and brain wall are formed.<sup>2</sup> During the first few weeks of embryonal life the process is practically the same in the brain wall and retina, and, although the layers have been given different names, in the beginning at least, the nuclear zone of the optic cup as well as the inner zone of the brain wall should be called the ependymal, for in each it manufactures the cells which make the definitive retina and brain wall.

At the 8 mm. age (fig. 5) the two layers are present in both brain wall and inner wall of optic cup. The cellular or ependymal, zone is much broader than the acellular, or marginal, zone in each. The section of the 8-mm. embryo is not only of interest because it shows the two zones but it is cut so that it passes almost vertically through the fetal fissure, and the inner wall of the optic cup can be seen to be continuous with the floor of the brain into which the nerve fibers will pass after they have developed in the inner wall of the optic cup and have grown back through the wall of the optic stalk.

The 10 mm. age is much more developed (fig. 6). The optic stalks are longer; their walls are continuous with the brain wall; and their lumen with the cavity of the brain. The marginal zone (fig. 7) of the inner wall of the optic cup passes through the fetal fissure along the ventral wall of the optic stalk and is continuous with the marginal zone of the brain wall. At this age the marginal and ependymal zones are nearly equal to each other in width in both optic cup (fig. 7) and brain wall (fig. 8). Fibers cross the marginal

zone at right angles to it in each and reach the surface. These fibers develop foot plates which join and form a membrane, the external limiting membrane of the brain wall (fig. 8) and the internal limiting membrane of the retina (fig. 7). Some cells have proliferated in the ependymal zones and have migrated into the marginal zones of brain wall and inner wall of optic cup. In this study it must be borne in mind that the external surface of the brain wall is continuous with the inner surface of the optic cup so that which is external in the one is internal in the other.

The embryo of the 24 mm. age shows much more development in both the brain wall and retina (fig. 9). A section through the upper portion of the head passes through the neopallial walls and the anterior horns of the lateral ventricles. The pallial walls are continuous with the corpus striatum, and the lateral ventricles communicate freely with the third ventricle. The brain wall at this age has three zones, an inner, middle, and outer, the ependymal, mantle, and marginal zones.<sup>2</sup> A section through the anterior pallial wall of the 24 mm. embryo seen under higher magnification (fig. 10) shows a dense layer of cells with oval nuclei adjacent to the ventricle, the ependymal zone. Its cells have proliferated and some have wandered out into the marginal zone and formed the mantle zone. In the mantle zone the cells are more loosely arranged and many have round nuclei. The mantle zone fades into the acellular marginal zone, and there is no sharp line of demarcation between the ependymal and mantle zones. The ependymal zone corresponds to the nuclear zone of the retina, for in both retina and brain wall its cells proliferate and migrate into the marginal zone. Many of these cells may be seen in the marginal zone of each. Fibers cross the marginal zone at right angles to it,

and where they reach the surface they form a membrane, the external limiting membrane, as Mueller's fibers form the internal limiting membrane of the retina.

In transverse sections of the eye of the same 24 mm. embryo (fig. 11) the inner wall of the optic cup presents an appearance similar to that of the pallial wall. There is a dense layer of cells with oval nuclei adjacent to the residual lumen of the optic vesicle, the nuclear zone, which corresponds to the ependymal zone of the pallial wall. In this layer the cells proliferate and then wander out or migrate into the marginal zone and form the other layers of the retina. In the equatorial and anterior regions it is seen to shade into the marginal layer as the ependymal zone did in the pallial wall to form the mantle zone. In the retina this portion is also loosely arranged and contains cells with rounded nuclei. These cells are the ganglion cells, and in the region near the optic nerve, the relatively older portion of the eye, they form a separate layer, the ganglion cell layer. The axons of these cells grow into the lighter-colored area, the marginal zone, and form the nerve fiber layer. The nerve fiber layer corresponds to the outer part of the marginal zone in the brain wall. Fibers cross the nerve fiber layer (fig. 12) at right angles to it, and when they reach its inner surface they end in foot plates which join and form the membrana limitans interna, which corresponds to the external limiting membrane of the pallial wall.

In embryos of the 40 mm. age (fig. 13) the brain wall has developed very much. In sections through the upper part of the head the neopallial walls present a zone of densely packed cells with oval nuclei adjacent to the lateral ventricles, the ependymal zone. The ependymal zone shades out into a layer of loosely arranged cells, the inner portion of the mantle zone.

Beyond this is a light-colored layer, the outer portion of the mantle zone, composed of fibers from the corpus striatum and the optic thalamus. This layer will be the great white matter of the definitive brain. To the outer side of this is a dark layer of cells. These are cells that have proliferated in the ependymal zone and have migrated into the marginal zone and stopped at the striatum cribrosum of the marginal zone. They are the pyramidal cells. This layer will be the definitive gray matter of the cortex of the brain. To the outer side of this layer is a thin fiber layer, the marginal veil of His. These two divisions of the marginal zone will be the cortex of the definitive brain. Bands of nerve fibers from the corpus striatum can be seen passing into the nerve fiber portion of the mantle zone.

A section of the neopallial wall of the same embryo (fig. 14) seen under higher magnification shows the details of each zone. The ependymal zone with its cells with oval nuclei corresponds to the nuclear zone of the retina. In this zone adjacent to the ventricles are some nuclei which stain intensely and have the appearance of the primitive cones in the retina of the same embryo. Occasional cilia are seen projecting into the ventricle. The inner or nuclear portion of the mantle zone, the loosely arranged cells shading off from the denser ependymal zone, contains many cells with round nuclei and some oval cells with processes which are fibers extending to the surface to form the outer limiting membrane as Mueller's fibers do to form the internal limiting membrane in the retina. The nuclear portion of the mantle zone corresponds to what will be the inner nuclear layer of the retina. The nerve fiber portion of the mantle zone corresponds to the inner plexiform layer of the retina. Numerous cells with round and oval nuclei are seen in it. The nuclear portion of the marginal

zone, the pyramidal cell layer, corresponds to the ganglion cell layer of the retina, and the outer fiber portion, the marginal veil of His, to the nerve fiber layer of the retina; the outer limiting membrane of the pallial wall to the internal limiting membrane of the retina. In a section through a portion of the retina (fig. 15) of the same embryo there is a dense outer layer of cells with oval nuclei adjacent to the original lumen of the optic vesicle, the nuclear layer. It corresponds to the ependymal zone and nuclear portion of the mantle zone of the pallial wall. To the outer side of this is a row of cells with somewhat oval nuclei, the primitive cones (similar in appearance to the cells adjacent to the ventricle in the ependymal zone of the pallial wall). To the outer side of these cells is the external limiting or basement membrane. Occasional cilia are seen projecting into the residual lumen of the optic vesicle. To the inner side of the nuclear layer is a light-colored layer, the inner plexiform layer, which corresponds to the fiber portion of the mantle zone of the pallial wall. To the inner side of this is the layer of ganglion cells which corresponds to the layer of pyramidal cells. To the inner side of this is the nerve fiber layer which is situated like the marginal veil of His. Mueller's fibers cross the nerve fiber layer and end in the *membrana limitans interna*, as the fibers which cross the marginal veil of His end in the external limiting membrane of the pallial wall.

The 45 mm. age (fig. 16) shows much more development of the brain wall and retina. A horizontal section through the eye reveals the nerve fibers passing from the nerve fiber layer of the retina into the optic nerve. In a section of the retina of the same embryo (fig. 17), to the temporal side of the nerve, seen under higher magnification, there is a dense zone of cells with oval nuclei adjacent to the

residual lumen of the optic vesicle, the nuclear layer which corresponds to the ependymal zone, and the nuclear portion of the mantle zone in the pallial wall. It is covered by the external limiting membrane to the inner side of which are the primitive cones that are connected to cilia outside the external limiting membrane. Similar cilia will be seen in the sections of the pallial wall of the same embryo. The nuclear layer can still be called the ependymal zone, for its cells are still being proliferated and differentiated. Its inner portion, that comparable to the mantle zone of the brain wall, will ultimately be separated by the external plexiform layer from nuclei of the rods and cones and will be the inner nuclear layer containing the bipolar cells, amacrine cells, and horizontal cells as well as nuclei of Mueller's fibers. To the inner side of this layer is a layer that will be the inner plexiform layer, which resembles the outer fiber portion of the mantle zone of the pallium. To the inner side of this is the ganglion cell layer, which corresponds to the pyramidal cell layer in the marginal zone of the pallium. To the inner side of the ganglion cell layer is the nerve fiber layer corresponding to the marginal veil of His. The nerve fiber layer is crossed at right angles by Mueller's fibers, which end in the *membrana limitans interna*, which occupies a position similar to the external limiting membrane of the brain wall. A higher magnification of a portion of the same retina nearer to its center (fig. 18) shows all the described details more perfectly. The ganglion cells with their dendrites, Mueller's fibers with their nuclei, the cone cells and their cilia.

Figure 19. Higher magnification. In a section of the anterior portion of the neopallial wall of the same embryo the ependymal zone is proportionately narrower than in the younger embryos, for so many of its cells have proliferated

and migrated. What is finally left of the ependymal zone will remain as the lining of the ventricles. In its inner portion there are cells adjacent to the ventricles resembling the primitive cones, and from this layer cilia project into the ventricles. They are not so numerous nor so large as in the retina. The cells in the inner or nuclear portion of the mantle zone are loosely arranged and are beginning to form in layers. This part corresponds to the inner part of the nuclear layer of the retina. The outer, or fibrous, division of the mantle zone is broader than before. In it many cells are seen. Long fibers, some of whose oval nuclei can be seen, cross it at right angles and end in the outer limiting membrane as Mueller's fibers were seen to end in the internal limiting membrane of the retina. The layer of pyramidal cells, which will be the definitive gray matter of the cortex,

is broader and more defined and resembles the ganglion cell layer of the retina. The outer fiber portion of the marginal zone, the marginal veil of His, is narrower. This layer will be the definitive molecular, superficial or neuroglia layer of the cortex.<sup>4</sup> It is located in a position similar to the fiber layer of the retina. Outside of this is the external limiting membrane, which corresponds to the membrana limitans interna of the retina. From this age on both the retina and brain wall become more highly specialized and their resemblance in microscopic sections lessens but their functional relation increases with the development of their many coördinating features and the joy of seeing becomes the expression of a developed brain.

1914 Travis Street.

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- <sup>4</sup> Gray's Anatomy. American edition. Reëdited by John Chalmers Da Costa, Philadelphia and New York, Lea Bros. & Co., 1905, p. 919.

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The illustrations which follow are unretouched photographs of sections in my private collection and are of human embryos with the exception of figure 1.

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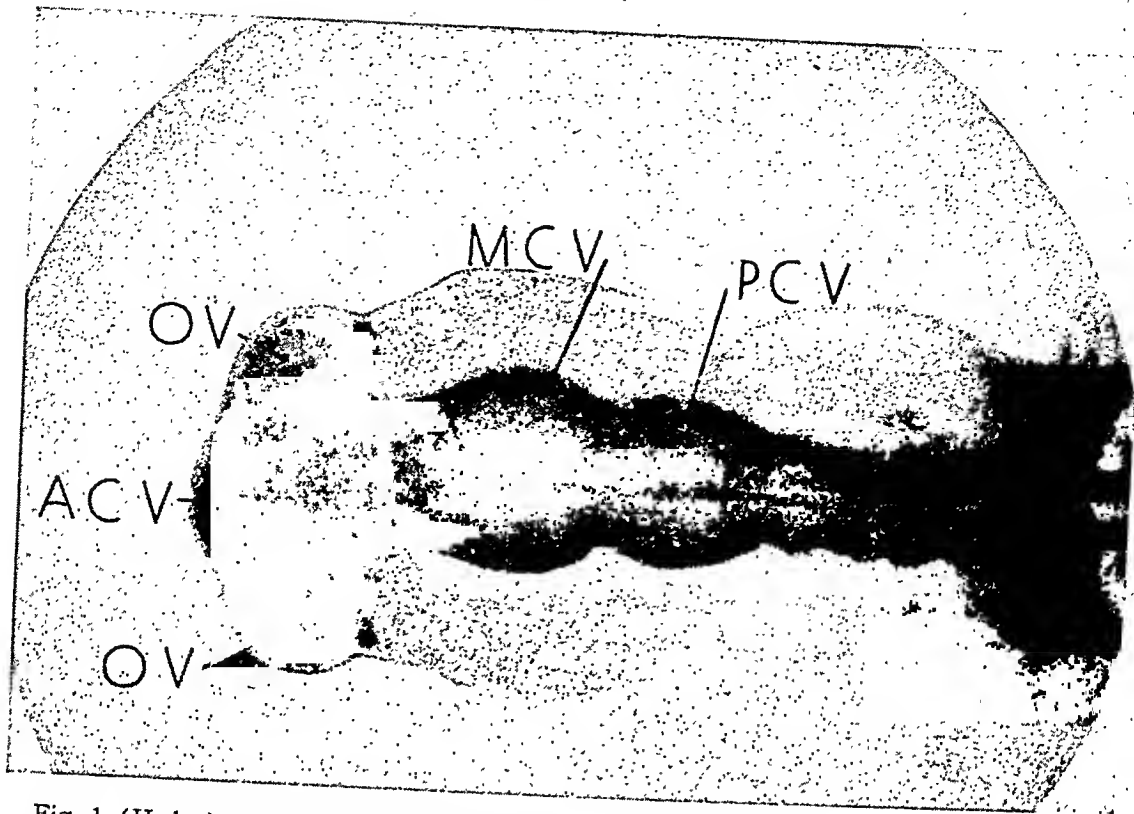


Fig. 1 (Haden). 33 hour chick. A C V, anterior cerebral vesicle (Prosencephalon). M C V, middle cerebral vesicle (Mesencephalon). P C V, posterior cerebral vesicle (Rhombencephalon). O V, optic vesicles.

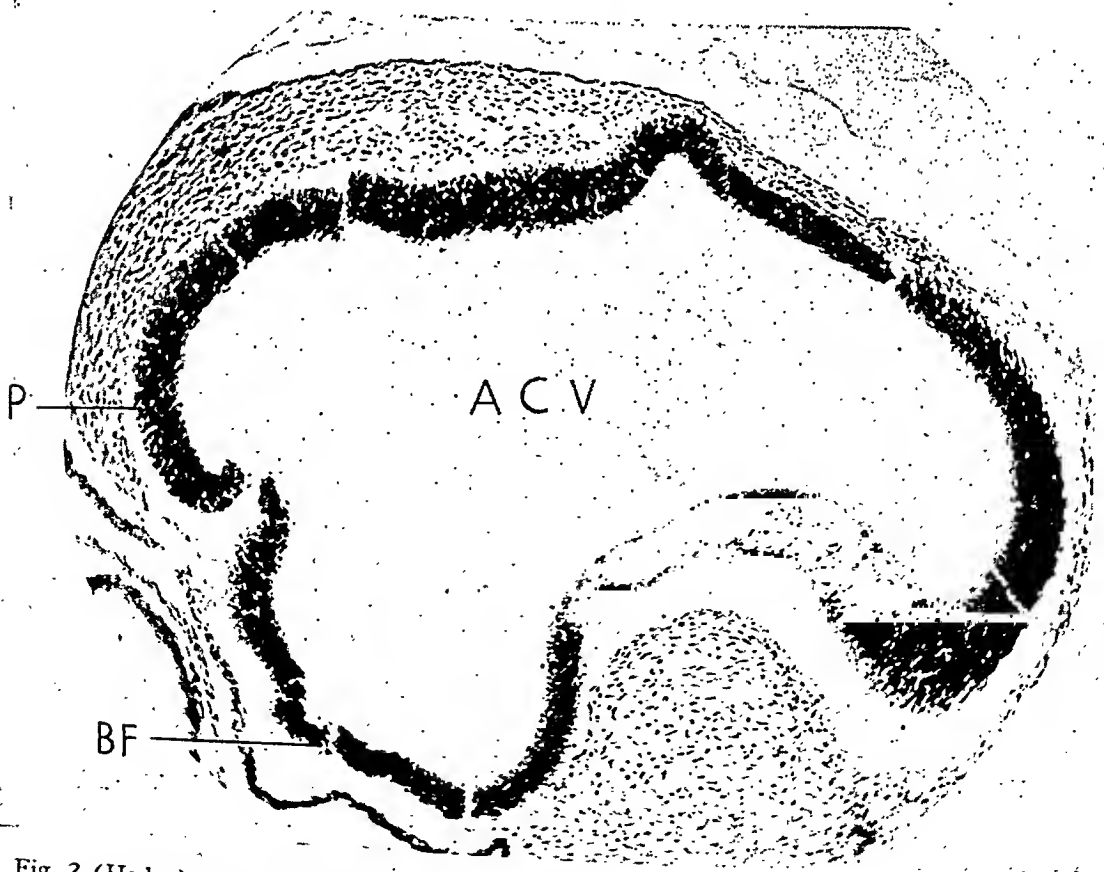


Fig. 2 (Haden). 4 mm. human embryo. Median sagittal section through the A C V, anterior cerebral vesicle. P, pallium, or mantle. B F, position of future brain floor.



Fig. 3 (Haden). O C, optic cup. O S, optic stalk. N Z C, nuclear zone of inner wall of optic cup. M Z C, marginal zone of inner wall of optic cup. E Z B, ependymal zone of brain wall. M Z B, marginal zone of brain wall.



Fig. 4 (Haden). O C, optic cup. O S, optic stalk. F F, foetal fissure. N Z C, nuclear zone of optic cup. M Z C, marginal zone of optic cup. E Z B, ependymal zone of brain wall. M Z B, marginal zone of brain wall.





Fig. 5 (Haden). 8 mm. embryo, lower portion of A C V, anterior cerebral vesicle. O C, optic cup. E Z B, ependymal zone of brain wall. M Z B, marginal zone of brain wall. N Z C, nuclear zone of optic cup. M Z C, marginal zone of optic cup. O S, optic stalk. F F, fetal fissure.

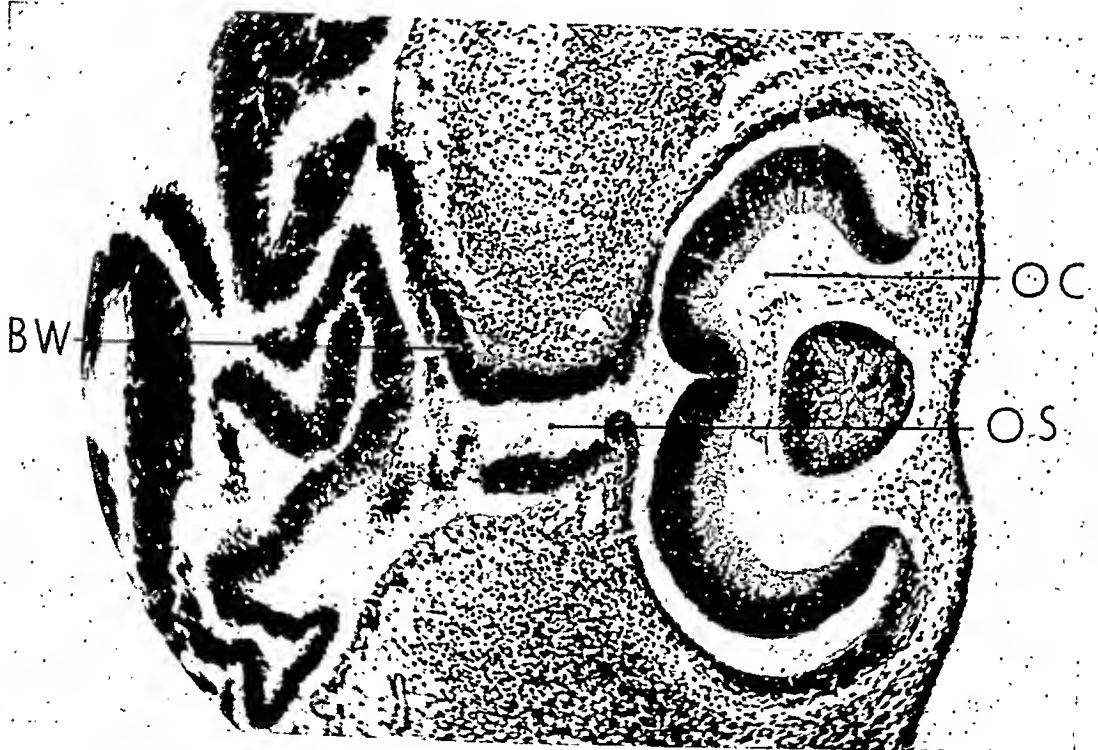


Fig. 6 (Haden). 10 mm. embryo. O C, optic cup. O S, optic stalk. B W brain wall.

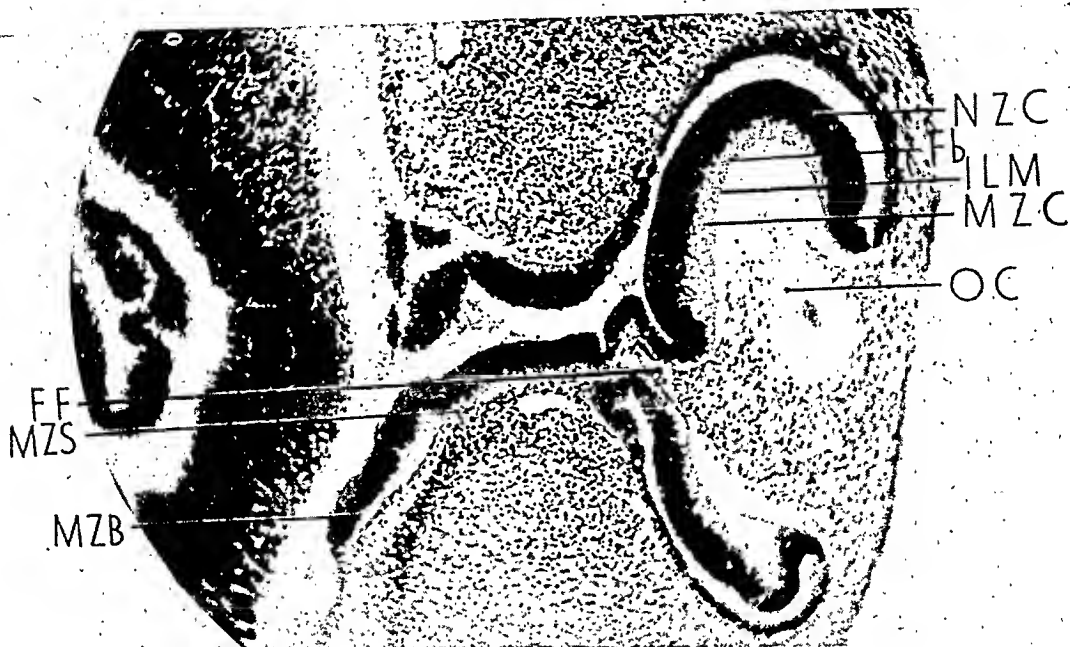


Fig. 7 (Haden). 10 mm. embryo. Section passes through F F, fetal fissure. N Z C, nuclear zone cup. O C, optic cup. M Z C, marginal zone cup. M Z S, marginal zone of stalk. M Z B, marginal zone of brain wall. Fb, Mueller's fibers. I L M, internal limiting membrane.



Fig. 8 (Haden). 10 mm. embryo, section of brain wall (anterior cerebral vesicle) higher level than figure 6. E Z B, ependymal zone of brain wall. M Z B, marginal zone of brain wall. C, cells in marginal zone. Fb, fibers crossing marginal zone to end in E L M, external limiting membrane.

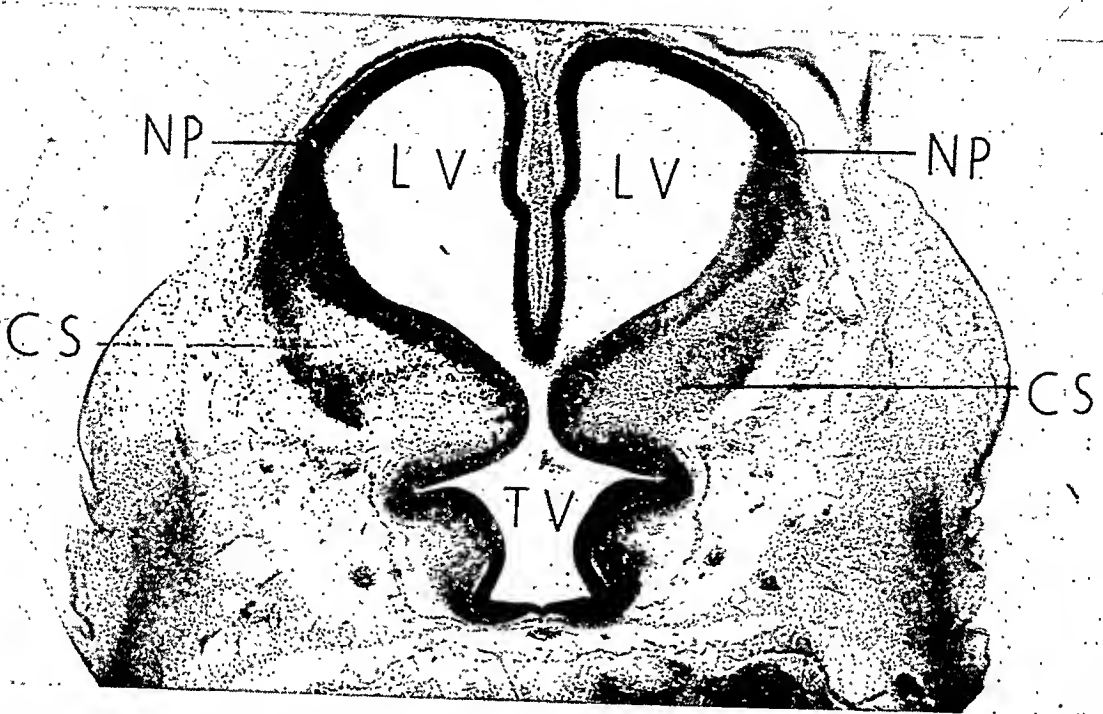


Fig. 9 (Haden). 24 mm. embryo, section passes through upper part of head. N P, neopallium (brain wall). L V, anterior horn of lateral ventricle. T V, third ventricle. C S, corpus striatum.

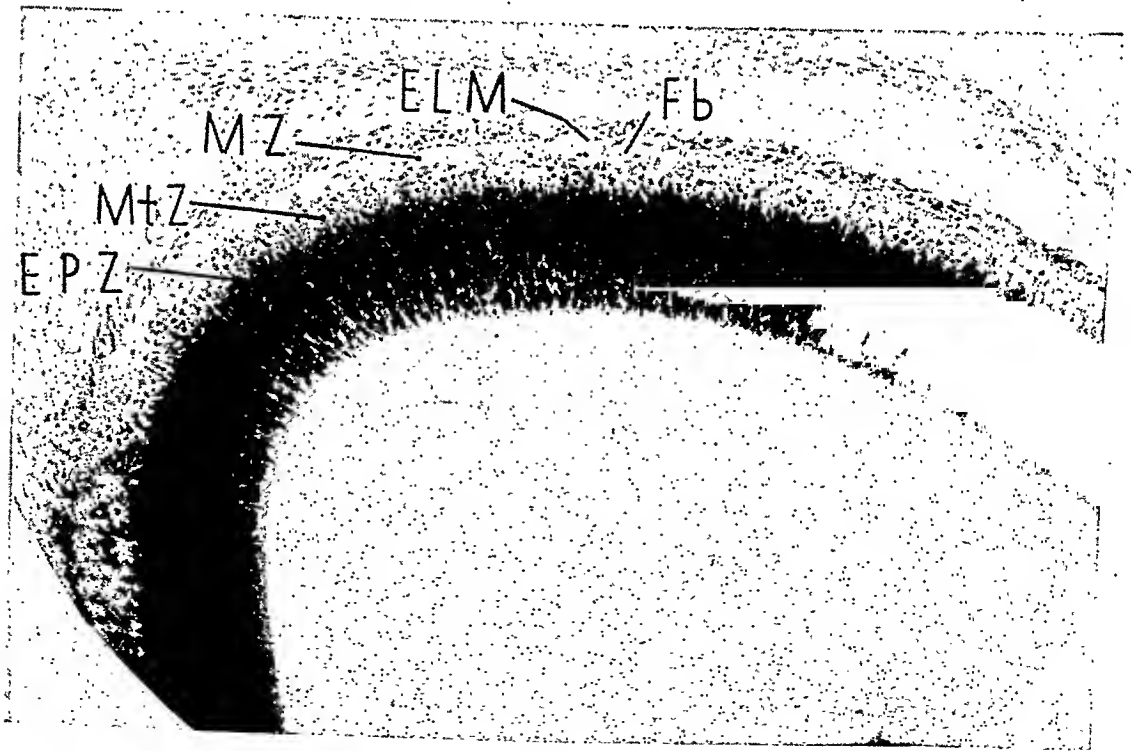


Fig. 10 (Haden). 24 mm. embryo higher magnification of a section of brain wall of figure 9. E P Z, ependymal zone of brain wall. Mt Z, mantle zone of wall. M Z, marginal zone of brain wall. Fb, Fibers crossing marginal zone to end in. E L M, external limiting membrane.

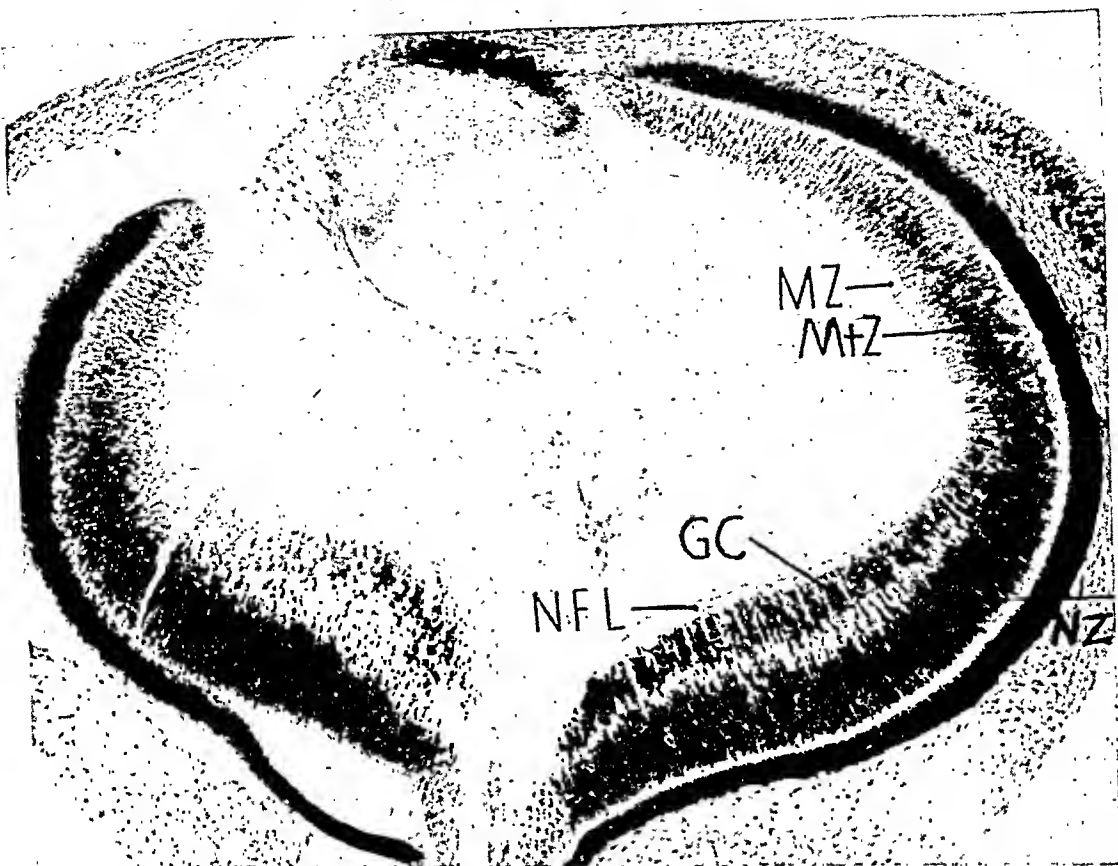


Fig. 11 (Haden). 24 mm. (same embryo as in figs. 9 and 10). Horizontal section through eye. N Z, nuclear zone. Mt Z, mantle zone. M Z, marginal zone. G C, ganglion cell layer. N F L, nerve fiber layer.

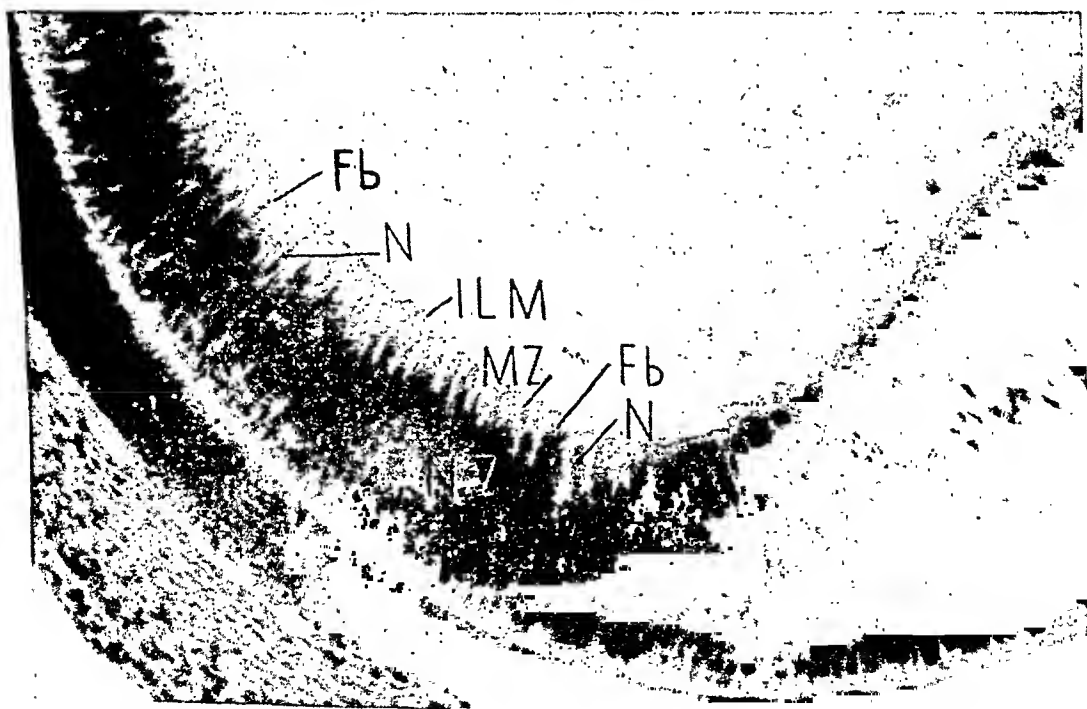


Fig. 12 (Haden). 24 mm. embryo, higher magnification of section of retina in figure 11. Fb, Mueller's fibers. I L M, internal limiting membrane. N, nuclei of Mueller's fibers. M Z, marginal zone. N Z, nuclear zone.

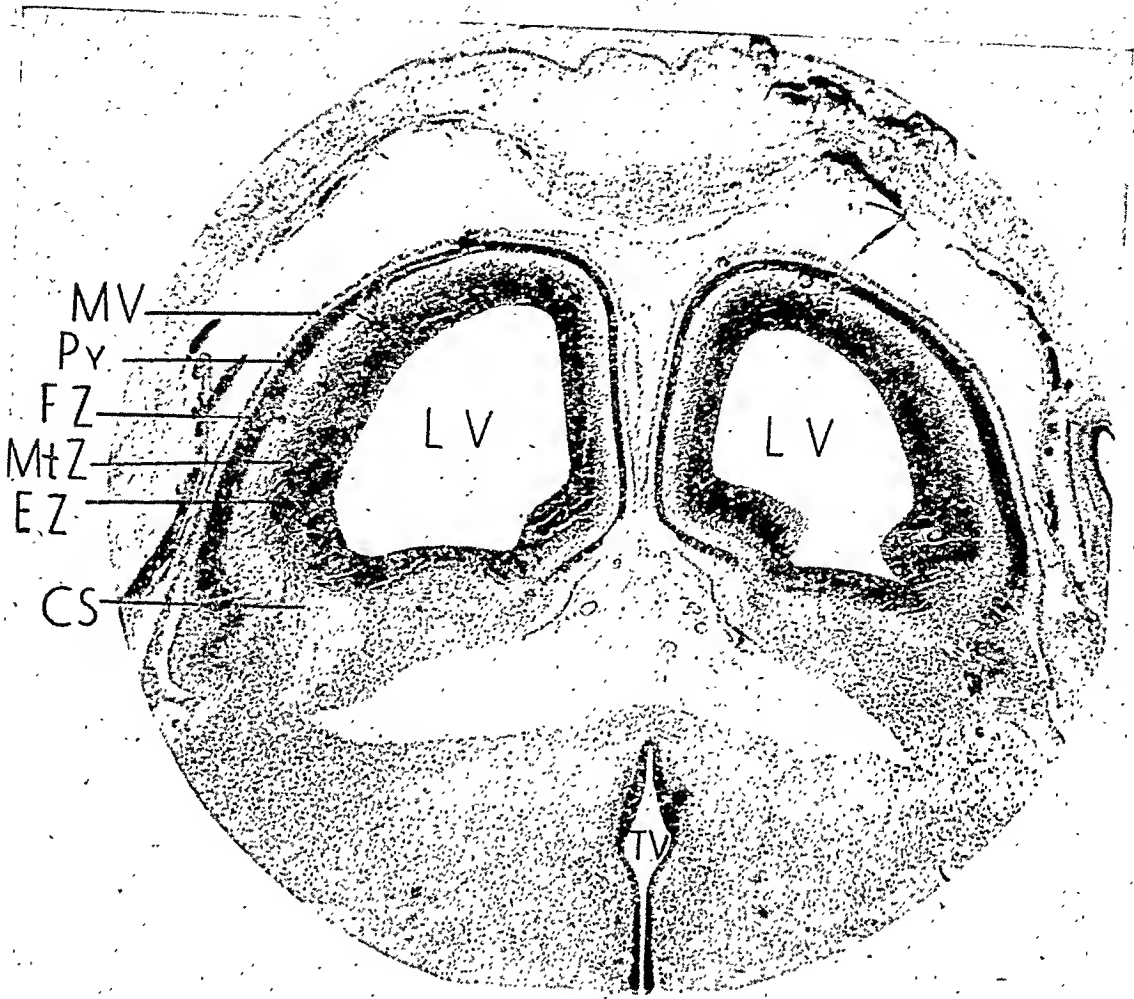


Fig. 13 (Haden). 40 mm. embryo. Section through upper part of head and through neopallium (brain wall). E Z, ependymal zone of brain wall. Mt Z, mantle zone (nuclear portion). F Z, fiber portion of mantle zone. Py, pyramidal cell layer. M V, marginal veil of His. C S, corpus striatum. T V, third ventricle. L V, lateral ventricle.

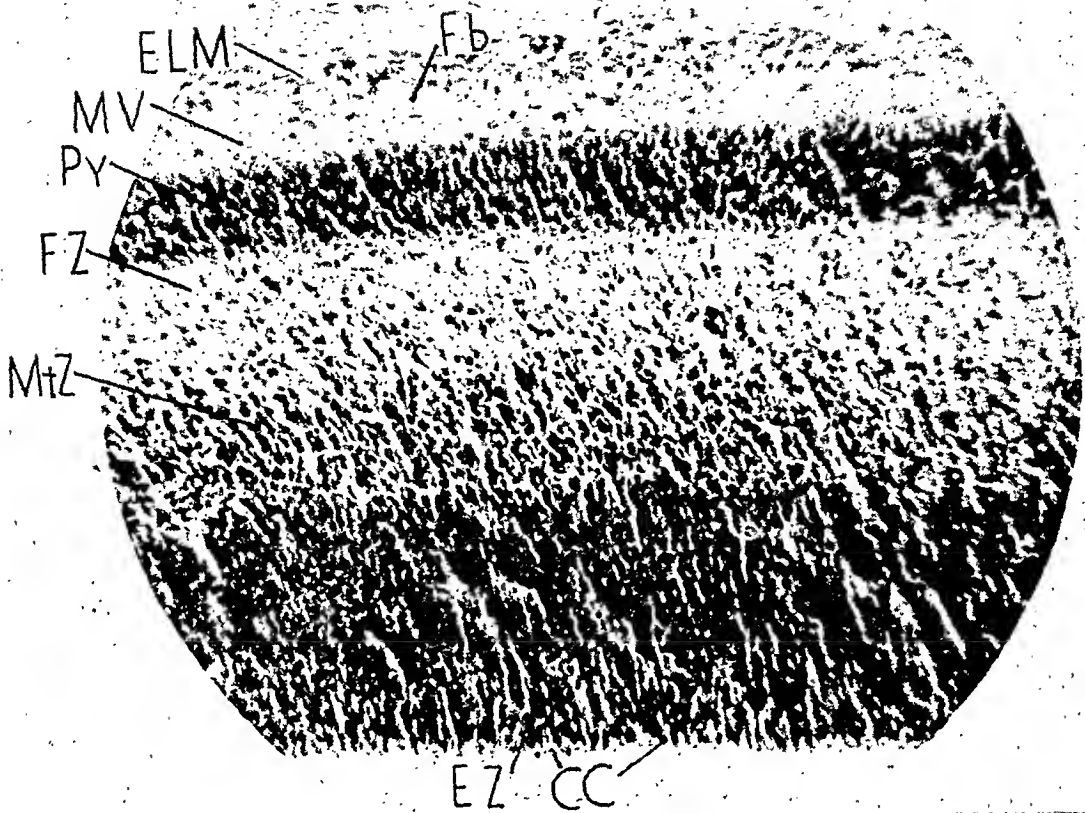


Fig. 14 (Haden). 40 mm. embryo, higher magnification of a section of brain wall in figure 13. E Z, ependymal zone. C C, cells resembling cone cells. Mt Z, nuclear portion of mantle zone. F Z, fiber portion of mantle zone. Py, layer of pyramidal cells. M V, marginal veil of His. Fb, fibers crossing M V to end in E L M, external limiting membrane.

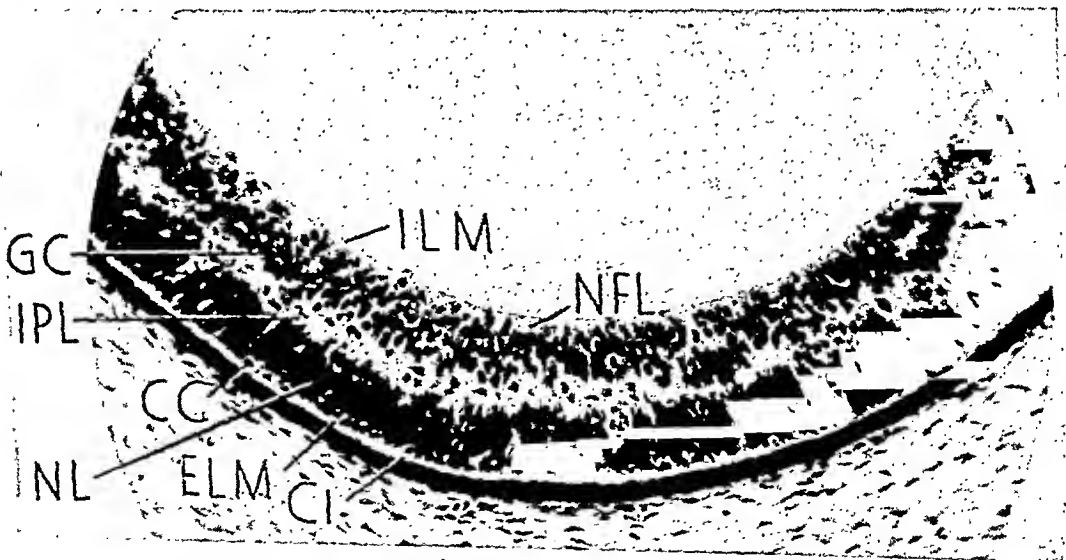


Fig. 15 (Haden). 40 mm. embryo. Section of retina of embryo in figures 13 and 14. C I, cilia. E L M, external limiting membrane. C C, cone cells. N L, nuclear layer. I P L, internal plexiform layer. G C, ganglion cell layer. N F L, nerve fiber layer. I L M, internal limiting membrane formed by foot plates of Mueller's fibers seen crossing N F L, nerve fiber layer.



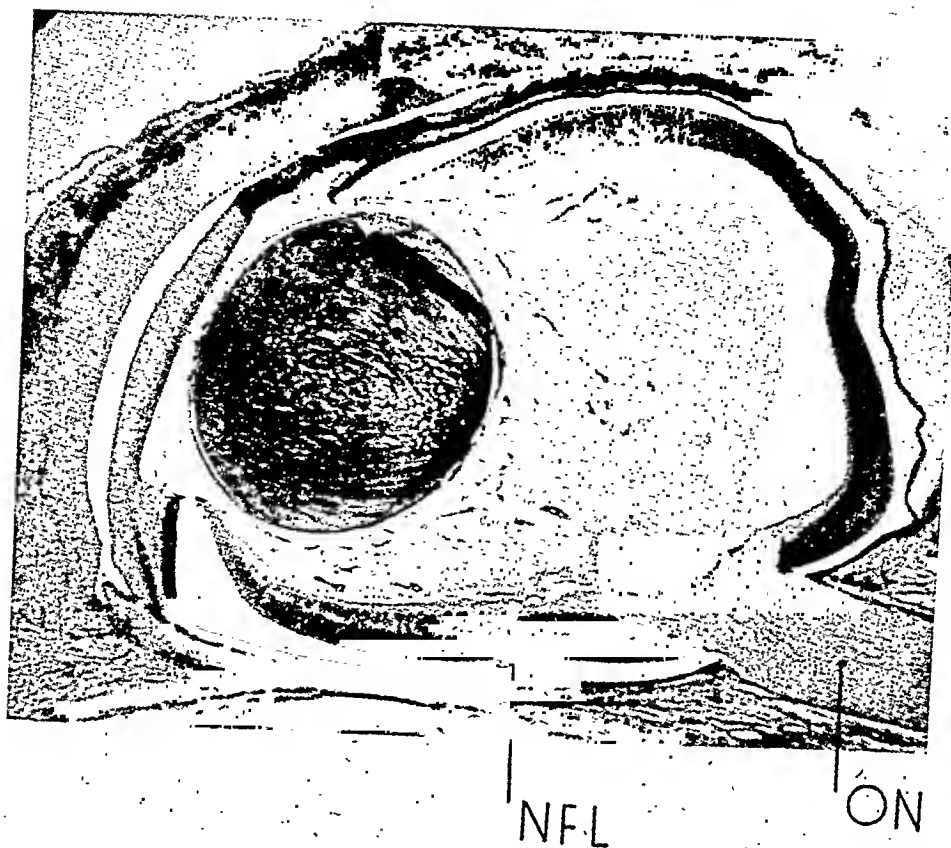


Fig. 16 (Haden). 45 mm. embryo. Horizontal section through eye. O N, optic nerve.  
N F L, nerve fiber layer.

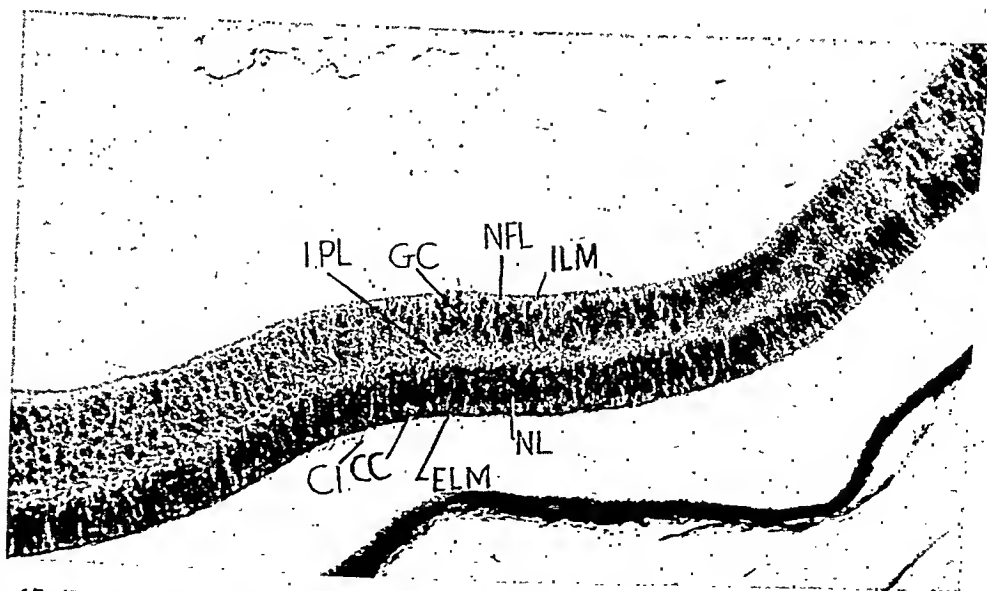


Fig. 17 (Haden). 45 mm. embryo. Higher magnification of a section of retina from temporal side of optic nerve of figure 16. C I, cilia. E L M, external limiting membrane. C C, cone cells. N L, nuclear layer. I P L, internal plexiform layer. G C, ganglion cell layer. N F L, nerve fiber layer. I L M, internal limiting membrane, formed by foot plates of Mueller's fibers, seen crossing N F L, nerve fiber layer.

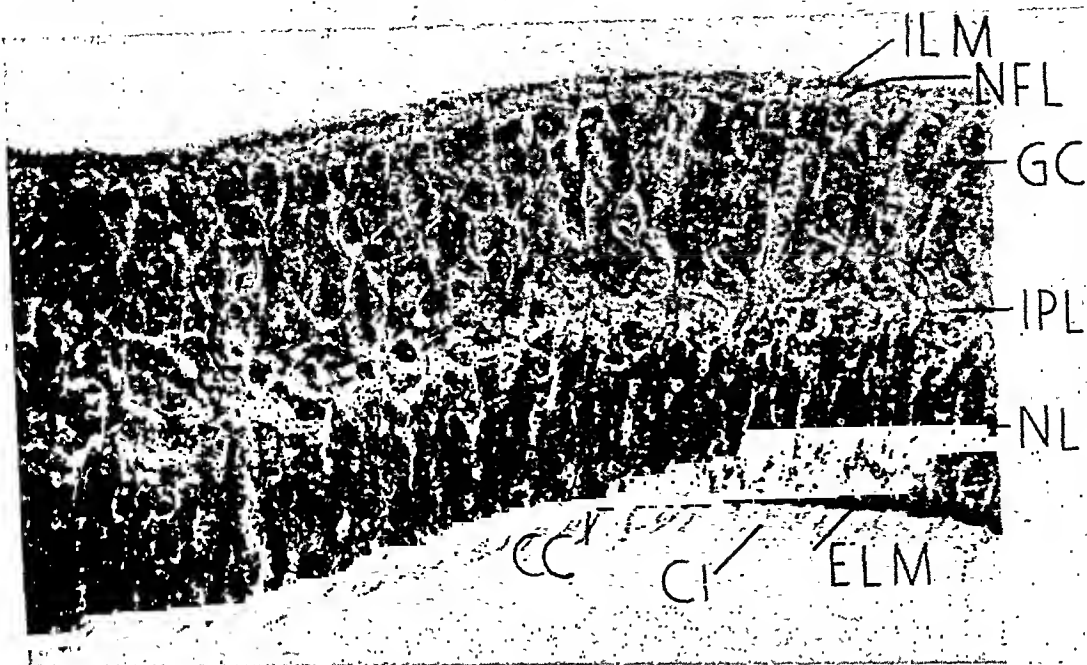


Fig. 18 (Haden). 45 mm. embryo. Higher magnification of retina near its center. C I, cilia. E L M, external limiting membrane. C C, cone cells. N L, nuclear layer. I P L, internal plexiform layer. G C, ganglion cell layer. N F L, nerve fiber layer. I L M, internal limiting membrane, formed by foot plates of Mueller's fibers—seen crossing N F L, nerve fiber layer.

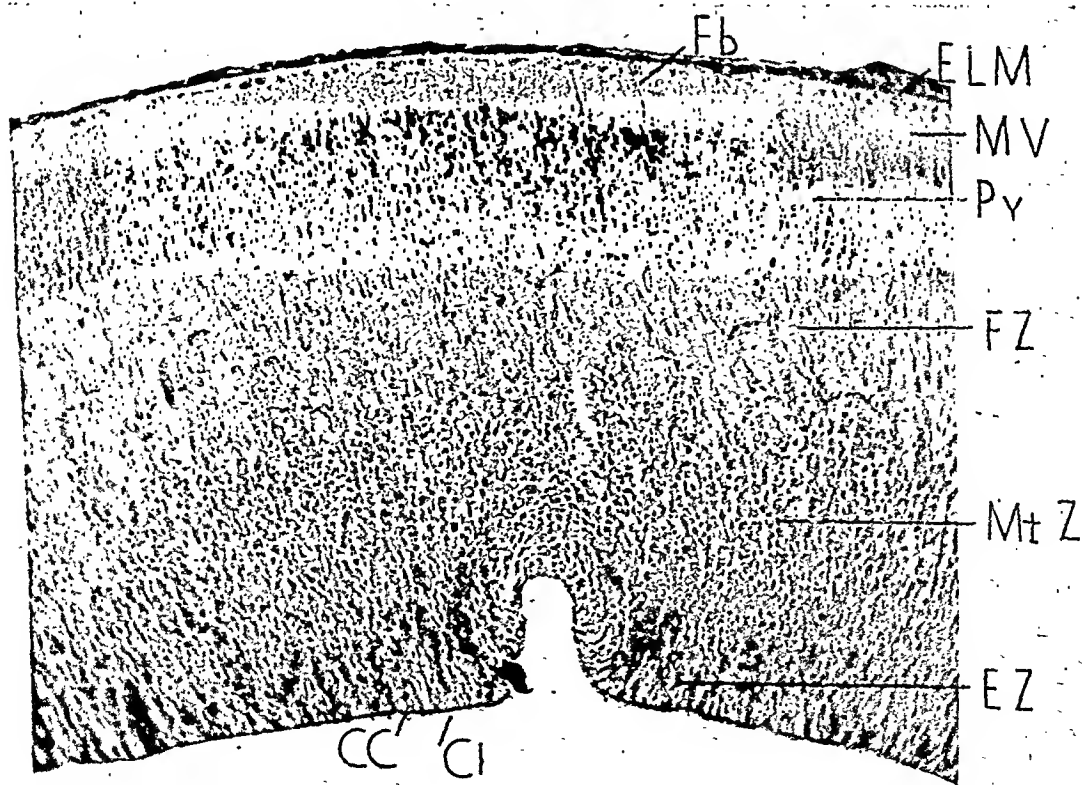


Fig. 19 (Haden). 45 mm. embryo. Section through neopallium (brain wall). C I, cilia. C C, cells resembling cone cells. E Z, ependymal zone. Mt Z, nuclear portion of mantle zone. F Z, fiber portion of mantle zone (will be definitive white matter of brain). Py, layer pyramidal cells (definitive gray matter of cortex). M V, marginal veil of His. Fb, fibers crossing M V and ending in E L M, external limiting membrane.



## OCULAR COMPLICATIONS OF CERTAIN TROPICAL DISEASES\*

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Many men now serving with the Armed Forces throughout the world may later seek medical attention from civilian physicians because of parasitic infections incurred in foreign service. Diseases now rare or unknown in the United States may later appear in many localities.

Fortunately, the majority of the parasitic diseases do not produce ocular complications. The five parasitic diseases which are most likely to produce ocular complications are malaria, trypanosomiasis, elephantiasis, loiasis, and onchocerciasis.

### MALARIA

Malaria is an acute or chronic disease caused by a protozoan parasite (*Plasmodium*), characterized by chills, fever, malaise, and generalized debility. Ocular complications resulting from this disease are due to capillary thromboses, anemia, or lowered general resistance.

The most common ocular complication mentioned in standard texts is dendritic keratitis. Post,<sup>1</sup> in discussing the etiology of dendritic keratitis, mentioned malaria as a factor. He stated that Ellet (1889), Kipp (1890), Wilder (1893), and Charles (1904) were early investigators reporting upon this condition. Finnoff<sup>2</sup> called attention to malaria as a cause of dendritic keratitis and cited two cases following the use of malaria for therapy in the treatment of neurosyphilis.

During a two-year tour of duty in the tropics, dendritic keratitis was seen rarely by the author among troops suffering from a high incidence of malaria. This was likewise found to be true at other

military hospitals in the same vicinity. Although there were in these cases numerous relapses, they were promptly and adequately treated; the patients were not permitted to become debilitated. This may have accounted for the low incidence of dendritic keratitis.

Townes<sup>3</sup> states that, during the past two years at an Army Regional Hospital, malaria has not proved to be a cause of dendritic keratitis. His cases comprised military personnel from stations both in the United States and overseas.

Maxwell<sup>4</sup> states that from March, 1943, to February, 1945, a total of 2,000 cases of malaria were treated at an Army General Hospital. Excluding all cases due to trauma, there were three cases of idiopathic keratitis in this entire group, two of which were chronic and one acute. During the same period, there were 48 cases of keratitis appearing among non-malarious individuals. Of this group seven cases were considered herpetic in origin.

Neither in older literature nor in more recent clinical studies can any conclusions relative to a positive relationship between malaria and dendritic keratitis be found. It is, therefore, believed unlikely that dendritic keratitis will appear with any degree of frequency among discharged service men who may suffer subsequent relapses of malaria.

Edema of the lids, iridocyclitis, optic neuritis, paresis of the extraocular muscles, arterial emboli, thromboses of the retinal veins, and hemorrhages into the retina and vitreous have been found to complicate malaria. Intraocular hemorrhages may occur when severe anemia exists.

\* Read to the St. Louis Ophthalmic Society, St. Louis, Missouri, February 23, 1945.

The more serious eye complications associated with malaria are more frequently the result of the drugs used in its treatment than of the disease itself. Atabrine has not been found to produce ocular complications. Quinine, on the other hand, may produce serious and permanent ocular complications in sensitive individuals, a small dose being sufficient to precipitate a reaction. The onset of complications may be sudden or gradual. An early ocular finding of quinine intoxication in sensitive individuals is a widely dilated pupil which is extremely sluggish or even immobile. Ophthalmoscopic study reveals evidence of edema of the retina to a varying degree, venous engorgement, and haziness of the optic disc. Later the edema and venous engorgement disappear, and a gradual narrowing of the arteries develops. The ischemia attendant upon the vasoconstriction may injure the ganglion cells of the retina to a varying degree, occasionally causing complete degeneration followed by ascending atrophy of the optic nerve. During this period there may be either a sudden or a gradual loss of central vision associated with peripheral contraction of the fields. Central vision may be recovered partially or completely following the cessation of the administration of quinine. Contraction of the peripheral fields, however, tends to be more permanent than changes in central vision.

Ocular complications from the use of quinine may be avoided by careful observation of the patient and frequent studies of the central and peripheral vision. It is obvious that the physician should be constantly on the alert for individuals who are sensitive to quinine.

#### TRYPANOSOMIASIS

The African variety of trypanosomiasis is an acute or chronic disease caused by a blood flagellate (*Trypanosoma gambiense*

or *Trypanosoma rhodesiense*), characterized by irregular fever, skin rashes, lymphadenitis (particularly post-cervical), and subsequent numerous nervous-system manifestations, with an increasing tendency to sleep and eventual severe debility leading to death in untreated cases.

Trypanosomiasis is found in Central, West, and East Africa (fig. 1). Strong<sup>5</sup> states that 4 to 5 percent of the natives in some communities, and as high as 90 per-

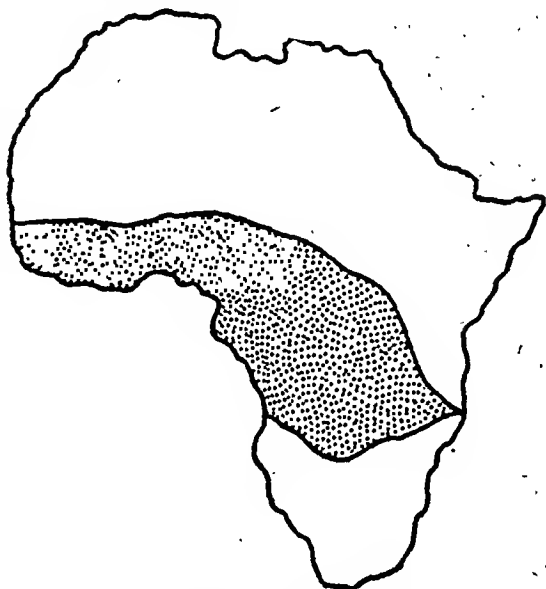


Fig. 1 (Reeh). Africa, showing distribution of trypanosomiasis.

cent in other communities, suffer from trypanosomiasis. A report of the League of Nations shows that over one million African natives are treated for trypanosomiasis each year.

Trypanosomiasis is transmitted by the vicious day-biting tsetse fly (genus *Glossina*). The incubation period is usually two to three weeks. The first stage of the disease consists of fever, skin rashes, and enlarged lymph nodes, particularly the post-cervical group. In this stage the intermittent fever is occasionally mistaken for malaria, and antimalarial therapy is erroneously given. Later a multiplicity of central-nervous-system symptoms may develop, the principal one being an increasing tendency to sleep.

The diagnosis depends upon the demonstration of the trypanosome in the blood, in fluid aspirated from lymph glands, or in spinal fluid (fig. 2). Centrifuged specimens of blood or spinal fluid may be necessary to produce an adequate concentration for microscopic study.

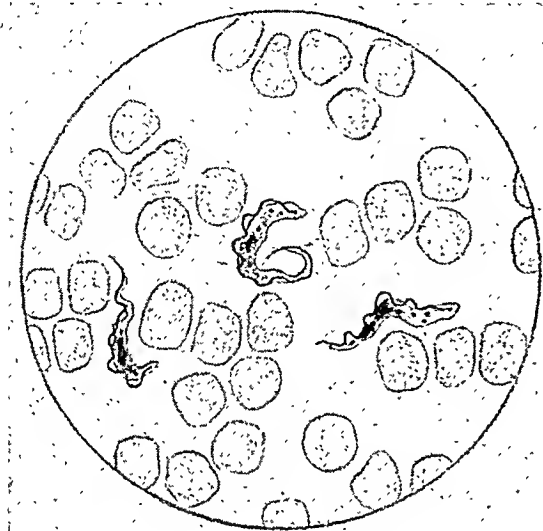


Fig. 2 (Reeh). Trypanosomes (stained blood smear).

When trypanosomes are not seen, animal inoculation with centrifuged specimens of blood or spinal fluid should be performed.

Occasionally ocular complications develop. They may be edema of the lids, interstitial keratitis, iridocyclitis, and chorioiditis. Tassman<sup>6</sup> states that a form of interstitial keratitis which is not usually found among individuals suffering from trypanosomiasis has been reported, on occasion, in various parts of Africa. It is said to be present in as high as 30 percent of the cases. This particular type of keratitis usually appears bilaterally and results in an opacity of all corneal layers, with subsequent vascularization.

It is well to suspect trypanosomiasis routinely among individuals who have lived in Africa. The ultimate cure of the disease depends upon early, vigorous

treatment aimed at eradication of the trypanosomes. In addition, the ocular complications will need specific attention.

Serious complications may result from the use of atoxyl or tryparsamide in the treatment of trypanosomiasis. In sensitive individuals there may be an early contraction of the peripheral fields, followed later by optic atrophy. When such drugs are used, frequent field studies should be made.

#### FILARIASIS

There are three types of filarial diseases that have been associated with ocular complications. They are elephantiasis, loiasis, and onchocerciasis.

ELEPHANTIASIS is a form of filariasis caused by an infestation of the lymphatic system with a threadlike roundworm, *Wuchereria bancrofti*, the male measuring 40 mm. by 0.1 mm., and the female 90 mm. by 0.28 mm.

The *Wuchereria bancrofti* (*Filaria bancrofti*) is found throughout the world in nearly all warm climates, affecting from 5 to 70 percent of the population in such localities. It is transmitted by various mosquitoes which usually bite at night.

The microfilariae, which are injected into the human by the mosquito, enter the lymphatic system and develop into adult worms. The gravid female produces microfilariae which appear in the peripheral blood vessels, principally at night when the mosquito is likely to feed. In a small percentage of cases the presence of a large number of adult worms in the lymphatic system leads to obstruction, with resulting edema of the various parts (particularly the legs, scrotum, and breasts), inflammation and secondary infection, enlargement and fibrosis of the lymph nodes, and irregular bouts of fever.

The eye is seldom involved in this dis-

ease process. Duke-Elder<sup>7</sup> states that there are islands in the Pacific where 90 to 100 percent of the inhabitants carry *Wuchereria bancrofti* without any evidence of intraocular complication. Nayar and Pillat,<sup>8</sup> Wright,<sup>9</sup> and Fernando<sup>10</sup> have, however, reported individual cases wherein the eye has been invaded by the *Wuchereria bancrofti*.

The diagnosis is based upon the history, blood smears which have been taken between 8:00 P.M. and 2:00 A.M., eosinophilia, and physical changes due to chronic lymphatic obstruction. The complement-fixation test and cutaneous test made with dog heart-worm antigen may also assist in the establishment of the diagnosis. These tests are group specific but not species specific and, therefore, are applicable in all types of filariasis.

As a general rule, medical treatment has been of little value. At the present time Anthiomaline (Merck & Co.) is being used. It reduces the number of microfilariae in the blood stream but does not affect the adult worms. Surgical intervention may become necessary to decrease the disability resulting from the edematous parts. In ocular involvement, removal of the *Wuchereria bancrofti* from the globe may be effected; however, much depends upon the size of the worm, its position in the globe, and the extent of inflammation present.

LOIASIS is a form of filariasis caused by the infestation with the *Loa loa*, commonly called the "Congo eye worm." The *Loa loa* is a threadlike roundworm, the male measuring 30 mm. by 0.3 mm., and the female 55 mm. by 0.4 mm.

Loiasis is found in West and Central Africa, especially along the Congo River and its tributaries (fig. 3). It is transmitted by a *Chrysops* fly (mango fly) which bites during the daytime.

During the bite of the *Chrysops* fly, microfilariae enter the body and there de-

velop slowly into adults, over a period of time which may be as long as three years. Adult worms may live in the body for as long as 14 or 15 years. They migrate in the connective tissue of the host, producing symptoms when in superficial tissues,



Fig. 3 (Reel). Africa, showing distribution of loiasis.

such as the conjunctiva, skin of the trunk, nose, eyelids, penis, and extremities. They are attracted to the surface by heat, but retreat into the deeper tissues upon exposure to cold. At times, allergic reactions occur in the skin and produce nodules the size of a hen's egg which last from three to four days. Such reactions are thought to occur during the discharge of microfilariae by the gravid female.

When the adult worm appears under the conjunctiva, considerable irritation, congestion, pain, and swelling of the lids result (fig. 4). It has been described by patients as "maddening."

Diagnosis depends upon the history, eosinophilia, presence of adult worms under the skin or conjunctiva, microfilariae in the blood stream, and positive skin and complement fixation reactions to dog heart-worm antigen. Microfilariae ap-

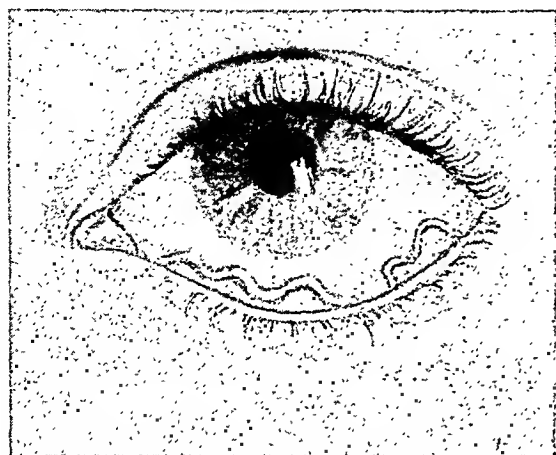


Fig. 4 (Reeh). *Loa loa* under the conjunctiva.

pear in the blood stream during the daytime.

Gifford and Konne,<sup>11</sup> and Cregar and Burchell<sup>12</sup> each reported a case in which an adult *Loa loa* was removed from under the bulbar conjunctiva.

The adult worm is extremely active and difficult to remove. When discovered under the conjunctiva, the eye should be carefully anesthetized, preferably with cocaine. The worm should then be grasped with a forceps, and a silk suture

passed under it and tied before removal is attempted. If, on the other hand, the worm is molested, it will disappear into deeper structures without delay. The use of drugs is ineffective. Removal of the adult worms is the only successful treatment.

ONCHOCERCIASIS is a form of filariasis caused by an infestation with *Onchocerca volvulus*, and characterized by multiple subcutaneous nodules with secondary disturbances of the skin and eyes.

The *Onchocerca volvulus* is a thread-like roundworm, the male measuring 18 to 30 mm. by 0.15 mm., and the female

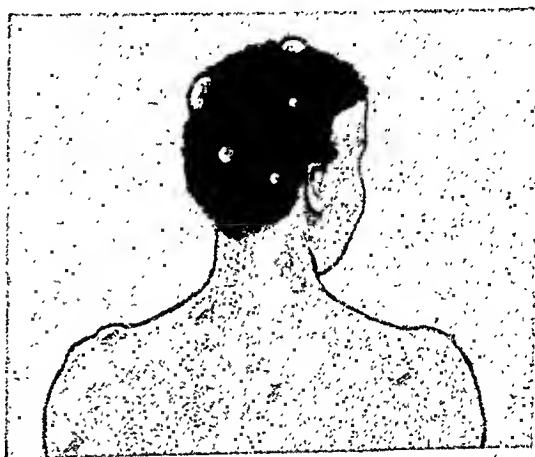


Fig. 6 (Reeh). Onchocerciasis, showing subcutaneous nodules.



Fig. 5 (Reeh). Africa, Southern Mexico, and Guatemala, showing distribution of onchocerciasis.

330 to 500 mm. by 0.4 mm. It is transmitted by a vicious, blood-sucking Simulium fly (black gnat or coffee gnat), which bites during the daytime.

Onchocerciasis occurs in West and Central Africa, and on the Pacific slopes of Southern Mexico and Guatemala, at an elevation of between 2,000 and 4,000 feet in the excellent coffee-growing areas (fig. 5). Duke-Elder<sup>7</sup> states that 40 to 100 percent of the native population of endemic areas are infested with this worm. Inhabitants of whole villages have been found to be blind from this cause. It is estimated that in some provinces of

the Belgian Congo, 10 percent of the entire population are blind from onchocerciasis. It has, therefore, rightfully been called the "blinding filarial disease."

Subcutaneous nodules appear in from 2 to 12 months after the bite of the infected fly (fig. 6). These nodules are firm, movable, grayish-white in appearance, and measure from 6 to 60 mm. in diameter. Adult filariae and microfilariae are found in the nodules. The gravid female releases microfilariae into the subcutaneous and adjacent tissue and into the lymphatics. Rarely are microfilariae found in the blood stream. In African cases the nodules develop principally on the trunk and extremities, whereas in Mexican and Guatemalan cases they are found principally on the head and shoulders.

Ocular complications develop after five or six years, especially when the nodules are located on the head and shoulders. The nodules may be confused with sebaceous cysts. The presence of microfilariae in the fluid aspirated from the nodules, or in tissue of an excised nodule or biopsy specimen, establishes the diagnosis. Examination of a thin slice of skin may also uncover the parasite. The history may lead one to suspect this condition. Eosinophilia and positive skin and complement-fixation tests may be of value.

The microfilariae are frequently noted entoptically by the patient. Estrada<sup>13</sup> reported that before inflammatory signs were prominent, microfilariae were noted in both the aqueous and vitreous of patients suffering from onchocerciasis, but were seen more often in the vitreous. The microfilariae were phototactic, tending to move away from the light beam. He examined the aqueous with a slitlamp, and the vitreous with an ophthalmoscope, using a plus 20D. to 40D. or 50D. lens. The patients were placed in a dark room for a short period prior to examination.

Conjunctivitis develops frequently. The

cornea is also frequently involved, punctate deep infiltrations appearing at first, later increasing in number and coalescing to form large plaques. This is followed by vascularization. Iridocyclitis usually accompanies the keratitis. Choroiditis and optic neuritis, with subsequent optic atrophy, are also found as ocular complications. Blindness results from the opacification of the cornea and the marked inflammation of the uvea and optic nerve. Scott<sup>14</sup> reported two cases of onchocerciasis with a transient ocular complication characterized by unilateral edema of the upper lid, proptosis, ciliary flush, and edema of the optic disc. He explained the condition on the basis of an anaphylactic edema produced in the orbit as a result of *Onchocerca volvulus* toxins.

The use of drugs is not particularly helpful. Prompt and complete excision of all subcutaneous nodules is the proper treatment. Ocular complications are treated specifically, depending upon the extent and the nature of the inflammation.

#### SUMMARY

After the present war physicians may encounter tropical diseases which are rare or unknown in the United States. These will be found in men who have served in the Armed Forces overseas or among individuals who will travel more extensively because of the vast postwar development of highways and airlines. Any one ophthalmologist will see an extremely limited number of cases, however. Fortunately, ocular complications are found to occur in only a few of the many tropical diseases.

Malaria is believed to be one of the causes of dendritic keratitis. At the present time clinical observations are not conclusive. The true etiologic basis is still vague. Other ocular complications of malaria are rare. The more serious complications result from the administration

of quinine to sensitive individuals.

African trypanosomiasis will probably always be extremely rare in the United States; however, the final outcome in untreated cases is so disastrous that it is well for all physicians to be on the alert.

Filarial diseases are extremely common in various parts of the world. Despite the widespread existence of the *Wuchereria bancrofti*, cases of entrance of this worm into the globe are rare. The adult *Loa loa* lives in the body for many years. It wanders freely about in connective tissue, frequently appearing beneath the skin of the lids or conjunctiva, hence the old name of *Filaria oculi*. It does not tend to enter the globe itself, however. The *Onchocerca volvulus*, on the other hand, is destructive

to the eye. The microfilariae enter the layers and chambers of the eye readily, producing inflammation which not infrequently results in blindness. Onchocerciasis may prove to be more troublesome in the future because of increased travel into areas of Mexico and Guatemala where the disease is endemic.

### CONCLUSIONS

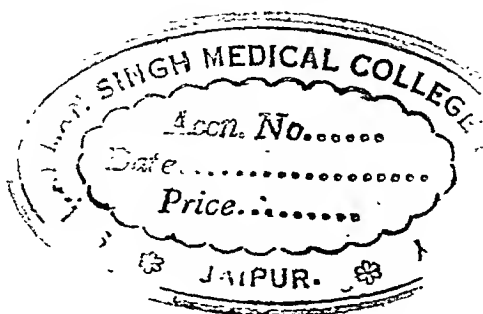
1. Certain tropical diseases produce ocular complications.

2. Such ocular complications may be improperly evaluated and inadequately treated because of failure to recognize the causative disease.

AAF School of Aviation Medicine.

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# JUVENILE DISCIFORM DEGENERATION OF THE MACULA\*

## REPORT OF 10 CASES. PATHOLOGIC FINDINGS

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In 1930, Junius<sup>1</sup> described four cases of juvenile macular exudative retinitis, a form of macular degeneration somewhat similar to senile disciform degeneration of the macula. Since then surprisingly few additional reports have been published dealing with this disorder. I believe this is due, not so much to the rarity of the condition, as to the fact that the disease has been considered as an ordinary central choroiditis. Some of the reports which have been published subsequent to Junius's article are those of Davis and Sheppard,<sup>2</sup> Verhoeff and Grossman,<sup>3</sup> and Gifford and Cushman.<sup>4</sup> More recently Adler and Scarlett<sup>5</sup> reported three similar cases under the title of juvenile macular exudative chroiditis. In this article are to be found further references to pertinent literature. The term "juvenile disciform degeneration of the macula" was applied to the condition by Verhoeff and Grossman, in connection with senile macular degeneration, for the sake of convenience. This term seems quite adequate, since both forms of degeneration appear to be closely related.

At present juvenile disciform degeneration is of significance mainly because it may be confused with malignant melanoma. However, when more is known about its etiology and pathogenesis, it will no doubt create greater interest and assume added importance.

So far no pathologic reports on juvenile disciform degeneration, as such, have been made. There are, however, on record three reports which may well represent the histologic picture of this condition. First of these is that of Verhoeff and Grossman<sup>3</sup> who presented the histologic findings from a case in a man aged 63 years which appeared and behaved clinically like the juvenile type. Sections revealed a subretinal exudate of serum half of which was confined beneath the pigment epithelium, raising it from Bruch's membrane in the form of a vesicle. A small amount of hyaline connective tissue was present at one side of the vesicle. Bruch's membrane showed two small breaks through which fibroblasts and capillaries passed. The choroid contained a few lymphocytes. The retina was normal and the retinal, choroidal, and posterior ciliary vessels were free from endovasculitis. These findings suggested to the authors that such a serous exudate may be the cause of juvenile disciform degeneration. Their suspicion is strongly supported by the histologic findings in one of the cases here reported.

The second report is that of Terry<sup>6</sup> who, discussing Verhoeff and Grossman's paper, presented sections obtained from a similar ocular lesion in a man 29 years of age. The pathologic picture was apparently of the same nature as in the senile form, with the presence of blood in and around the mound, but without arteriosclerosis. The adjacent area of the choroid was infiltrated with lymphocytes. Third is that of Gifford and Cushman,<sup>4</sup> who showed sections obtained from a case in a man also 29 years of age in which

\* The opinions and views set forth in this article are those of the writer and are not to be considered as reflecting the policies of the Navy Department. From the Ophthalmological Service, U. S. Naval Hospital, San Diego, California. Read before the joint staff conference. November 2, 1944.



there was a mass measuring about 3 mm. in extent, situated between the retina and the lamina vitrea. The mass consisted in part of the thickened retina containing large areas of cystic degeneration and a layer of closely packed fibrillar spindle cells. Much of the mass was formed by proliferated pigment-epithelial cells. The lamina vitrea varied in thickness, and it showed two defects through one of which a small vessel passed from the choriocapillaris into the mass. The retinal and choroidal vessels showed no sclerotic changes.

Between August, 1942, and September, 1944, 10 cases of macular disease, which I believe fall under the classification of juvenile disciform degeneration, were seen at the U. S. Naval Hospital in San Diego, California. Nine of the patients were admitted to the Hospital and one was seen in the clinic as an outpatient. All the patients were white men between the ages of 19 and 37, and in the active service of the Navy. In four of the men the right eye was affected, in five the left eye, and in one, both eyes. One of the cases was mistaken for malignant melanoma, consequently a specimen was obtained for histologic study. The lesions were invariably located in the macular area; they were elevated and roughly circular in shape, with vessels coursing in front of them. Their size varied approximately from 0.5 to 3 disc diameters, and their color from dark-brown to gray. The lesions were usually surrounded by sub-retinal edema, deep and superficial hemorrhages, and, in three of the cases, by whitish exudates. As the disease progressed, old hemorrhages would become absorbed and new ones would appear. Save for the presence of mild retinal vascular sclerosis in some of the patients, the fundi appeared otherwise normal. No inflammatory reactions, such as turbidity of the vitreous, cells in the anterior chamber, or keratic precipitates were ob-

served in any of the affected eyes. Visual acuity varied from 20/20 to 4/200. No associated abnormalities believed to be of etiologic significance were found present in any of the patients.

The treatment varied somewhat with the individual patient. Some of the patients were given typhoid vaccine by vein, while others received sodium nitrite and nicotinic acid. Most of the patients also received multiple vitamins and some were given ascorbic acid. Sulfathiazole was tried in one of the patients. Foci of infection were removed whenever indicated. All treatment was of little value except in the case of one patient (case 8) wherein the administration of sodium nitrite and nicotine acid seemed to be of benefit.

#### REPORT OF CASES

CASE 1. M. S., a fireman third class, aged 20 years, entered the Hospital on August 6, 1942, complaining of blurred vision in the left eye. Six weeks before, while on watch aboard ship, he had suddenly discovered that the vision in the left eye was blurred, and it had gradually become worse since then.

*Physical examination* disclosed a blood pressure of 132 systolic and 96 diastolic. Except for chronic tonsillitis, no other evident foci of infection were present. Roentgenograms of the chest revealed no pathologic changes. A complete blood count and urinalysis showed no abnormality. The Kahn test of the blood, complement-fixation test for gonorrhea, and agglutination test for brucellosis gave negative results. There was a moderate reaction to tuberculin (second strength P.P.D.).

*Ocular examination.* The right eye was normal, with vision of 20/20. Vision in the left eye was 20/30. The media of the left eye were clear; the optic disc was well defined and of normal color. The macular area (somewhat similar to that in figure

6) presented a deeply pigmented, grayish, disciform, elevated lesion slightly larger than the discs, with hemorrhages in and around it and surrounded by deep edema. Several blood vessels coursed in front of it. The rest of the fundus and anterior segment of the eye were normal. There was an absolute central scotoma corresponding to the lesion.

Tonsillectomy was performed shortly after the patient's admission to the Hospital. He remained in the Hospital approximately six months, during which time he was given typhoid vaccine intravenously and large doses of vitamins A and B complex, orally, but without apparent benefit. Vision, at first, was gradually reduced to 20/200 and then it slowly improved to 20/50. Hemorrhages, in and around the lesion, would disappear, only to reappear a few days later. At the time of discharge from the Hospital, no hemorrhages were present but the lesion was of about the same size as on admission and vision was 20/50.

CASE 2. L. J. H., a seaman second class, aged 19 years, entered the Hospital on November 2, 1942, because of blurred vision and slight pain in the right eye. Vision had become suddenly impaired nine days before, and since then he had gradually developed a dull pain in this eye.

Physical examination revealed a blood pressure of 120 systolic and 80 diastolic. The tonsils were enlarged and infected. The blood count was 10,350 white cells with 79 percent polymorphonuclears and 21 percent lymphocytes. The Kahn test of the blood, complement-fixation test for gonorrhea, and agglutination test for brucellosis gave negative results. Tuberculin test (second strength P.P.D.) gave a positive reaction. Roentgenologic examination of the chest showed no pathologic changes.

*Ocular examination.* Vision in the right eye was 20/60, and in the left, 20/15. The left eye was entirely normal. External structures, anterior chamber, iris, pupil, and lens of the right eye were normal. The vitreous was clear. Examination of the fundus showed the optic disc and retinal vessels to be normal. The

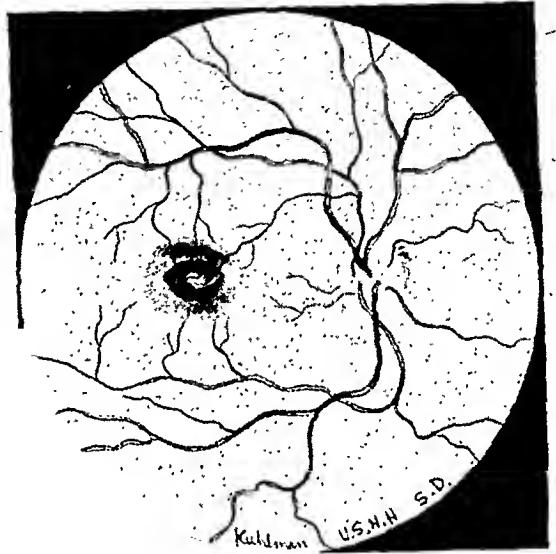


Fig. 1 (Lucic). Case 2. Ophthalmoscopic appearance of the right eye approximately six months following the onset of the disease; vision 4/200.

macular region presented an irregular, horizontally ovoid, dark-gray, elevated lesion, about one half the size of the disc, with vessels running over it and surrounded by a circular area of deep edema. No hemorrhages nor white spots were present. The fundus, otherwise, appeared normal. A corresponding central scotoma was present.

Tonsillectomy was performed shortly after the patient's admission to the Hospital. During the course of treatment, he was given typhoid vaccine intravenously, sulfathiazole orally, and large doses of multiple vitamins, without benefit. During the ensuing four months of daily observation, no hemorrhages were seen and vision varied between 20/40 and 20/200.



Fig. 2 (Lucic). Case 2. Photomicrograph of a section showing moundlike mass of tissue and serum exudate ( $\times 20$ ).

There was no apparent change in the size of the lesion but it became darker and the center acquired an amber color.

The patient was allowed to go home and was not seen for 40 days. On his return, vision was 4/200. The lesion (fig.

1) was slightly larger, darker, and more elevated. It presented a central, opaque-white area in which small new blood vessels were visible. No hemorrhages were present. A diagnosis of malignant melanoma was made and the eye was enucleated on April 14th, approximately six months after the onset of the disease.

*Pathologic examination.*

The eye was normal except for the lesion in the macular area (fig. 2). The elevation of the retina was due to a moundlike mass of tissue, measuring 0.9 mm. in length and 0.3 mm. in height, which was surrounded by serum exudate extending about 1 mm. beyond the borders of the mass. The mass (fig. 3) was made up



Fig. 3 (Lucic). Case 2. Higher-power magnification of the same section shown in figure 2 ( $\times 50$ ).

mostly of hyaline connective-tissue cells and a few proliferated pigment cells, among which were a few fine blood vessels. The pigment epithelium was lifted up so as completely to surround the main mass except at its summit, where it was flattened out, and the new tissue extended beyond the pigment layer to come in contact with the neuroepithelium. The raised portion of the pigment epithelium was made up of several layers of swollen cells. A new layer of pigment cells had begun to proliferate at the base, especially on the nasal side. This produced the picture of two distinct layers of pigment epithelium, enclosing between them the main portion of the new tissue. The lamina vitrea was ruptured in at least two places, through which connective-tissue cells from the choroid extended into the mass. The choroid was twice as thick in the area of the lesion as elsewhere in the eye and it showed lymphocytic infiltration which was particularly heavy in one of the sections. The rods and cones were completely destroyed over the entire extent of the lesion, including the area of serum exudate. The rest of the retina appeared normal save for some edema of the internuclear layer. The retinal and ciliary vessels appeared normal. The choroidal vessels in the region of the lesion were dilated and the arteries showed considerable thickening of their muscular walls. The optic disc appeared normal.

CASE 3. J. R. T., a chief machinist's mate, aged 35 years, entered the Hospital on May 3, 1943, complaining of blurred vision in the left eye, photophobia, and frontal headaches. He had first experienced blurring of vision in the left eye, suddenly, approximately five months before, while aboard ship. Since then vision had become somewhat improved, but he developed frontal headaches and photo-

phobia. He complained of no symptoms referable to the right eye.

*Physical examination* revealed blood pressure of 130 systolic and 70 diastolic.

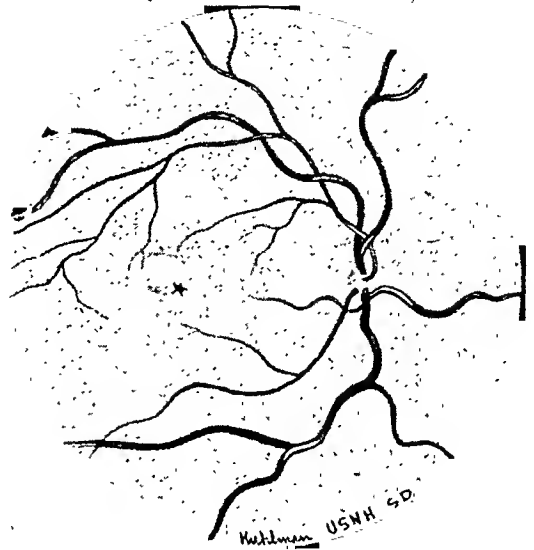


Fig. 4 (Lucic). Case 3. Ophthalmoscopic appearance of the right eye on first admission (May, 1943) showing an old, nonelevated lesion; vision 20/20.

Special examinations disclosed the presence of four alveolar abscesses with extensive pyorrhea, and a focus of infection in the prostate gland. Roentgenograms of the chest revealed no pathologic changes. The Kahn test of the blood, complement-fixation test for gonorrhea, and agglutination-test for brucellosis gave negative results. Tuberculin test (second strength P.P.D.), gave a strongly positive reaction. The blood count was within the normal limits, and urinalysis disclosed no pathologic changes.

*Ocular examination.* Right Eye. Vision was 20/20. External structures, anterior chamber, iris, pupil, lens, and vitreous were normal. Examination of the fundus (fig. 4) showed the optic disc and the retinal vessels to be normal. Just temporal and slightly superior to the fovea was an irregular, grayish-white, nonelevated le-

sion about three quarters the size of the disc with several vessels coursing in front of it. Its center presented a clump of pigment; its borders were irregular and free from pigment. There was no edema of the surrounding retina. When viewed with the binocular ophthalmoscope, the lesion appeared to be behind the retina. The rest of the fundus was normal.

Left Eye. Vision was 20/30. The external structures and the condition of the

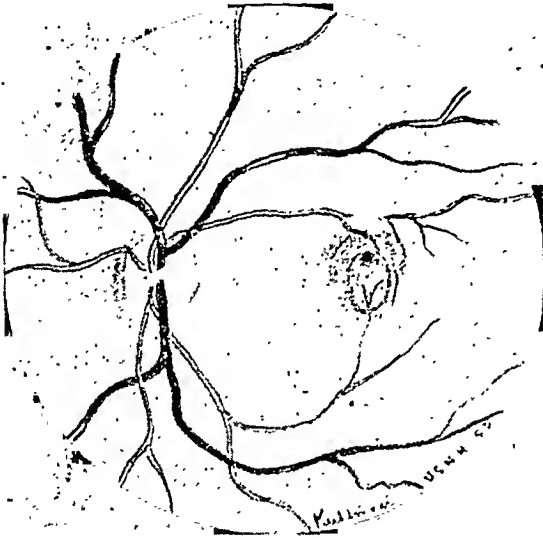


Fig. 5 (Lucic). Case 3. Ophthalmoscopic appearance of the left eye on first admission (May, 1943); vision 20/30.

media were similar to those noted in the right eye. Examination of the fundus disclosed the nerve head to be normal. The macular region (fig. 5) presented an elevated, dark-gray, lenticular lesion with sharp borders, about three quarters the size of the disc, with a small, grayish center and surrounded by a small area of subretinal edema. Two thirds of the superior portion of the lesion was surrounded by a deep, horseshoe-shaped hemorrhage, and a small flame-shaped hemorrhage was present on its superior edge. Two retinal vessels coursed in front of the lesion. One large branch of the superior temporal artery showed a local, slight constriction, just above the lesion.

Shortly after hospitalization the affected teeth were extracted. The focus in the prostate gland was eliminated by massage. The patient was given typhoid vaccine intravenously and multiple vitamins orally, with no apparent influence on the lesion or vision. Between April 26th and July 19th, vision varied between 20/40 and 20/200. Superficial hemorrhages would gradually disappear only to reappear a few days later. The deep, horseshoe-shaped hemorrhage gradually extended downward until it encircled almost the entire lesion. By August 20th, most of the superficial and part of the deep blood had disappeared, and the lesion was smaller. Vision on this date was 20/30. On September 4th, a fresh, small, superficial hemorrhage was present at the superior border of the mound, but no deep-seated blood was visible. Vision on this date was 20/50. On September 15th, vision was 20/30, and the superficial hemorrhage was smaller. The patient was given 40 days' leave. On his return from leave, vision in the left eye was 20/30; the lesion had not changed in size and elevation but it was lighter in color. There were a few small hemorrhages at the upper border which became absorbed during the next few days. On November 17th, vision in the right eye was 20/20 and in the left eye, 20/30, when the man was discharged from the Hospital.

He was readmitted to the Hospital on April 4, 1944, now complaining of blurred vision in both eyes.

Vision in the right eye was 20/70. Besides the already described lesion, the right eye presented (fig. 6) a new, grayish, elevated lesion about the size of the disc, located inferior and nasal to the macula, surrounded by deep edema and a few superficial hemorrhages. Several vessels passed in front of it. The temporal arteries exhibited a strong pulsation, and



Fig. 6 (Lucic). Case 3. Ophthalmoscopic appearance of the right eye on second admission (April, 1944) showing a new lesion and constriction of one vessel; vision 20/70.

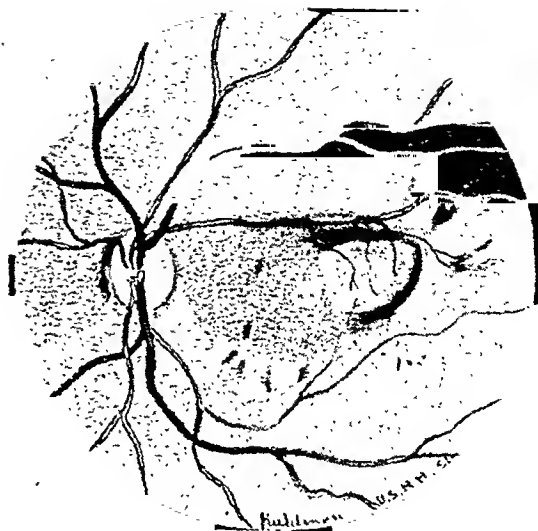


Fig. 7 (Lucic). Case 3. Ophthalmoscopic appearance of the left eye on second admission (April, 1944) showing recurrence of the lesion and vascular constrictions; vision 10/200.

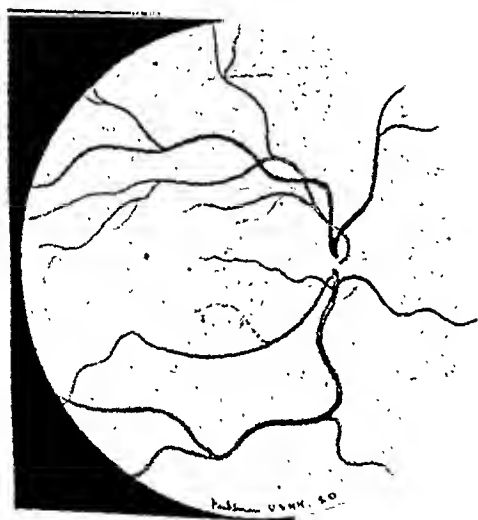


Fig. 8 (Lucic). Case 3. Ophthalmoscopic appearance of the right eye in August, 1944; vision 20/30.

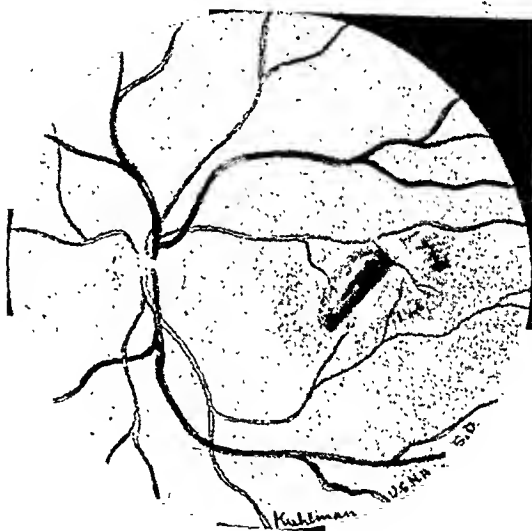


Fig. 9 (Lucic). Case 3. Ophthalmoscopic appearance of the left eye in August, 1944; vision 20/60.

one small branch of the inferior temporal artery, which passed over the lesion, was constricted. Vision in the left eye was 10/200. The macular area of the left eye (fig. 7), presented a highly elevated, grayish lesion about three times the size of the disc, with several vessels in front of it and surrounded by superficial

hemorrhages, few white exudates, and by a large area of subretinal edema. One artery which coursed just superior to the lesion and which had shown slight constriction on previous admission, now was more markedly constricted. A large branch of the inferior temporal artery was also constricted. All the larger

arteries pulsed strongly.

The blood pressure was 128 systolic and 68 diastolic. A careful physical examination disclosed nothing of significance except for a positive capillary resistance test.

During the next five months of observation and treatment with ascorbic acid and sodium nitrite, vision improved to 20/30 in the right eye and 20/60 in the left. The lesions changed in appearance approximately as shown in figures 8 and 9.

CASE 4. R. R. S., a warrant officer, aged 33 years, was seen as an outpatient on September 29, 1943, through the cour-

he accidentally became aware when he happened to rub his left eye. At that time vision in the right eye was 20/100, and 20/20 in the left eye. The right eye presented an oval, elevated, mottled, dark lesion just superior and temporal to the fovea about three-fourths disc diameter in size. There were fresh hemorrhages along its temporal border, and it was surrounded by marked edema which extended into the foveal region. Physical examination revealed nothing of importance. Roentgenograms of the chest disclosed no pathologic changes, and no foci of infection were present. There was a mild reaction to tuberculinoprotein. At the time of discharge from the Hospital, on June 11th, vision in the right eye was 20/30.

On September 29th, vision in the right eye was 20/50 and in the left eye 20/20. The left eye was normal. The right eye presented (fig. 10), a dark, elevated, ovoid lesion about three-fourths the size of the disc, located just superior and temporal to the macula. The center of the lesion was of an amber color, and two blood vessels coursed in front of it. There was an area of subretinal edema surrounding the lesion but no hemorrhages were present. The rest of the fundus and the anterior segment of the eye appeared normal.

CASE 5. V. G. C., a seaman, first class, aged 37 years, entered the Hospital on January 11, 1944, complaining of gradual diminution of vision in the right eye and distortion of objects, for the preceding four weeks.

*Physical examination* revealed a blood pressure of 118 systolic and 78 diastolic. The tonsils were absent. All the teeth had been extracted in 1936 because of pyorrhea. Roentgenograms of the chest showed an area of calcification, about

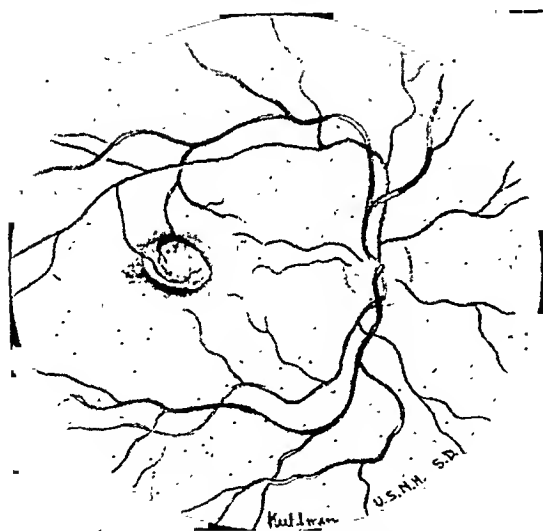


Fig. 10 (Lucic). Case 4. Ophthalmoscopic appearance of the right eye about seven months following the onset of the condition; vision 20/50.

tesy of Dr. Windsor S. Davies, under whose care he had previously been at another U. S. Naval Hospital. Transcript of his medical records showed that on December 30, 1942, he was examined for promotion to warrant officer, at which time vision was recorded as 20/30 in the right and 20/20 in the left eye. On February 10, 1943, he was admitted to a Naval Hospital because of blurred and distorted vision in the right eye of which

3 cm. in diameter, in the posterior portion of the left upper lobe. There was a mild allergic reaction to tuberculinoprotein (first strength P.P.D.). The Kahn test of the blood, agglutination test for brucellosis, and a complement-fixation test for gonorrhea gave negative results. The capillary-resistance test produced numerous petechiae in three minutes.

*Ocular examination.* Vision in the right eye was 20/200. This eye presented (fig. 11) a dark-greenish, ovoid, elevated lesion in the macular area about three-fourths disc diameter in size, surrounded by an area of subretinal edema, with vessels coursing over it. The center of the lesion was of amber color, its borders were distinct, and several small hemorrhages were present at its upper temporal and inferior nasal borders. The retinal arteries pulsated strongly; they were unduly tortuous, their reflexes were wide and soft, and mild arteriovenous compressions were present along the temporal vessels. The optic disc and the rest of the fundus appeared normal. A corresponding central scotoma was present. The left eye was normal save for vascular tortuosities and arteriovenous constrictions similar to those in the right eye. Vision in the left eye was 20/20.

Under the administration of typhoid vaccine, multiple vitamins, and ascorbic acid some of the hemorrhages became absorbed within a few weeks, only to recur shortly after. On March 1st, vision in this eye was 20/200, and several hemorrhages were present, especially at the lower nasal border; the shape and size of the lesion had not changed. On March 18th, a new, large hemorrhage was present at the inferior temporal border which extended to the central portion of the lesion within the next 10 days. On May 16th, vision was still 20/200. Under intravenous administration of

sodium nitrite vision improved to 20/70, but no apparent change occurred in the lesion and hemorrhages continued to recur.

CASE 6. J. E. B., a machinist's mate, second class, aged 30 years, entered the Hospital on February 25, 1944, primarily

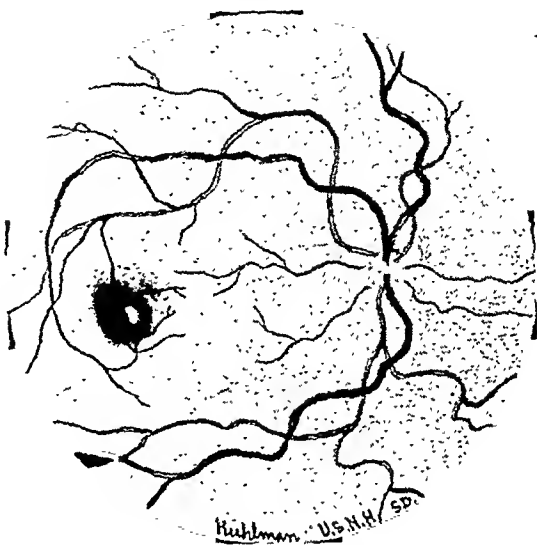


Fig. 11 (Lucic). Case 5. Ophthalmoscopic appearance of the right eye; vision 20/200.

because of pain in the back, dysuria, and hematuria of one month's duration. He also complained of impaired vision in the left eye which he had noticed for four years.

*Physical examination* disclosed a blood pressure of 126 systolic and 72 diastolic. The teeth, throat, sinuses, and prostate gland were normal. The Kahn test of the blood and agglutination test for brucellosis gave negative reactions. Cystoscopic and roentgenologic examinations revealed a large calculus in the left kidney. Nephrectomy was performed on February 29, 1944, and multiple, hard, black, rough calculi were found in the intrarenal pelvis and calyces. The patient made a normal recovery.

*Ocular examination* on May 3, 1944, revealed a normal right eye with vision



of 20/20. The left eye (fig. 12) presented a round, yellowish-gray, slightly elevated lesion in the macular area, about three quarters the size of the optic disc, whose edges were irregularly serrated and surrounded by an area of degeneration. Many small vessels and few clumps of

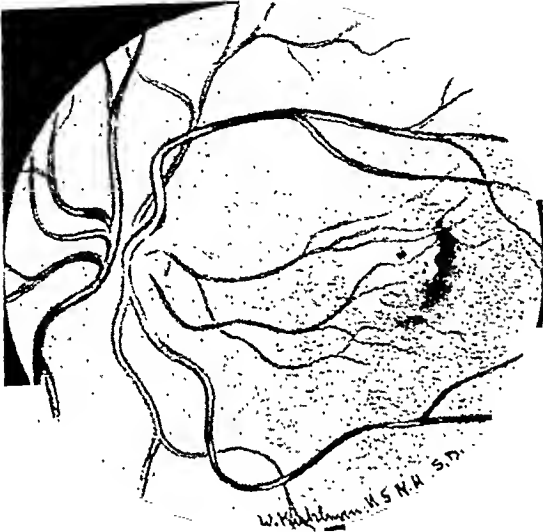


Fig. 12 (Lucic). Case 6. Ophthalmoscopic appearance of the left eye approximately four years after onset; vision 20/200.

black pigment were present in the lesion. Several blood vessels coursed in front of it. No hemorrhages were present. The edges of the optic disc were irregular. The rest of the fundus and the retinal vessels appeared normal. Vision in this eye was 20/200, and there was a corresponding central scotoma.

CASE 7. D. H. L., a lieutenant, U.S.N.R., aged 35 years, entered the Hospital on April 16, 1944, because of distorted and blurred vision in the left eye. Two months previously, while he was writing, vision in the left eye became suddenly distorted, and there was a dark shadow above the letters. The patient was seen by an ophthalmologist approximately two weeks later, at which time vision in each eye was 20/20 and there

were two small hemorrhages just below the macular area of the left eye "with question of an early active area of choroiditis." He was seen by another ophthalmologist about two weeks later at which time vision was 20/30 in the left eye and there was an "active area of chorioretinitis" in the macular area of the left eye.

*Physical examination* revealed a blood pressure of 132 systolic and 90 diastolic. The tonsils were absent. The teeth, sinuses, and prostate gland were normal. The blood count showed approximately 5,000,000 red cells and 8,500 white cells, with 65 percent segmented neutrophils and 30 percent lymphocytes. Platelet count was 250,000. Bleeding and coagulation time were within the normal limits. The Kahn test of the blood and agglutination test for brucellosis gave negative reactions. Tuberculin (first strength P.P.D.) produced a marked reaction. Roentgenologic examination of the chest disclosed no pathologic changes. Capillary-resistance test was positive, numerous petechial hemorrhages appearing in three minutes.

*Ocular examination.* The right eye was normal, with vision of 20/20. Vision in the left eye was 20/70. The anterior chamber and cornea were free from inflammatory reaction. The media were clear. The borders of the optic disc were somewhat irregular, and there was a small patch of choroidal atrophy on its nasal side. The macular area (fig. 13) presented an elevated, dark-greenish, somewhat irregular lesion with indistinct borders about the size of the optic disc. The upper border of the lesion was just below the central portion of the macula. It was surrounded by an area of subretinal edema about three times as large as the lesion itself. One large branch of the inferior temporal artery presented a

local constriction just as it branched off the main vessel. It coursed over the lower border of the main lesion, giving off several branches coursing toward the superior border. Another smaller vessel, a branch of the superior temporal artery, presented more marked local constrictions as it passed above the lesion. There were several hemorrhages in the main lesion and surrounding it. The rest of the fundus appeared normal.

Under large doses of ascorbic acid and multiple vitamins, vision, at first, rapidly improved to 20/50, but by May 12th numerous fine, whitish exudates developed

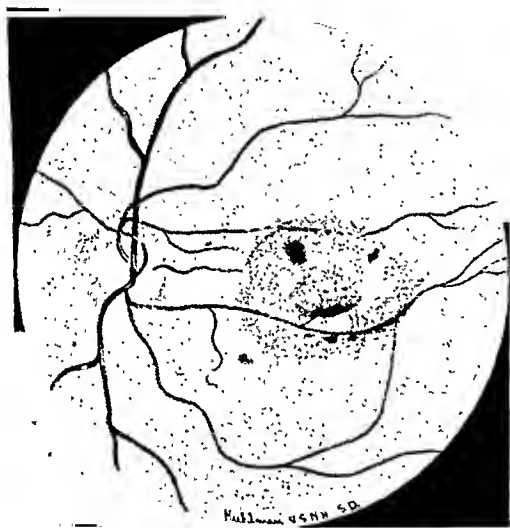


Fig. 13 (Lucic). Case 7. Ophthalmoscopic appearance of the left eye, showing lesion and constriction of vessels; vision 20/70.

which simulated "retinitis circinata," and vision was reduced to 20/200. On May 16th, intravenous injections of sodium nitrite (100 mg. daily) were started, under which vision improved to 20/40, hemorrhages became less numerous, and exudates thinned out. During the next four months vision was reduced to 20/200 in spite of continued treatment with ascorbic acid, nicotinic acid, typhoid vaccine, and sodium nitrite.

CASE 8. D. E. L., an aviation radio-man, first class, aged 24 years, entered the Hospital on May 19, 1944, because of a dark mass in the macular region of the left eye which his ophthalmologist

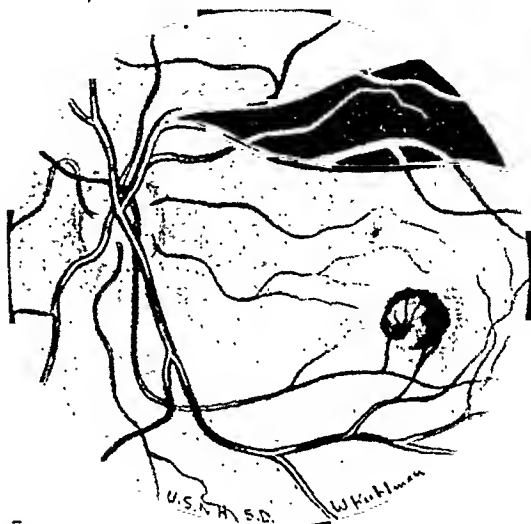


Fig. 14 (Lucic). Case 8. Ophthalmoscopic appearance of the left eye. The dark lesion was mistaken for melanoma; vision 20/70.

thought to be a melanoma. The patient complained of blurred vision in the left eye and a dull pain over the left side of the forehead of about three weeks' duration.

*Physical examination* revealed a blood pressure of 132 systolic and 92 diastolic. Roentgenograms of the chest disclosed no pathologic changes. No foci of infection were found present in the mouth, throat, sinuses, or prostate gland. The only positive finding was a mild reaction to tuberculin (first strength P.P.D.). The capillary-resistance test was negative. Blood count was within normal limits.

*Ocular examination.* The right eye was normal, with vision of 20/20. Vision with the left eye was 20/70. The media of the left eye were clear, the blood vessels and the optic disc appeared normal. The area just temporal and inferior to the macula

(fig. 14) presented a dark-brown, disciform, elevated lesion about two-thirds the size of the optic disc, surrounded by an area of subretinal edema slightly larger than the disc. Several blood vessels coursed in front of the lesion. No visible hemorrhages were present. The rest of

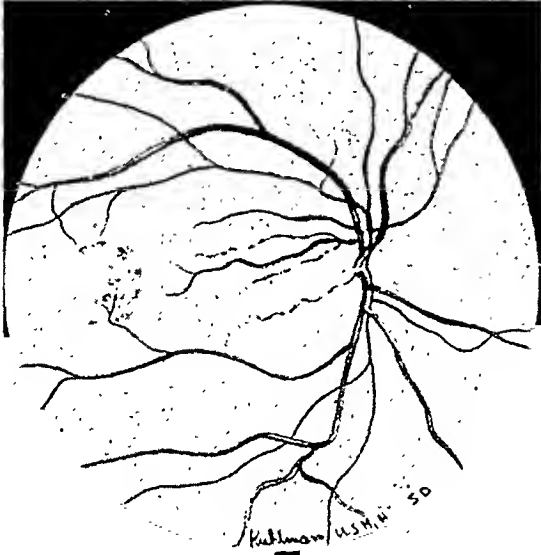


Fig. 15 (Lucic). Case 9. Ophthalmoscopic appearance of the right eye, showing lesion and constriction of vessels; vision 20/70.

the fundus and blood vessels appeared normal.

On the day of admission the patient was started on daily intravenous injections of sodium nitrite, the first dose consisting of 50 mg. and the subsequent doses of 100 mg. each. On May 27th, vision was 20/20, there was less subretinal edema, but three small hemorrhages had appeared along the superior border of the dark lesion. On June 2d, sodium nitrite was discontinued; there was a superficial hemorrhage along the inferior border of the lesion, but vision was still 20/20. On June 9th, there was no appreciable change in the appearance of the lesion, and vision was 20/20. Daily intramuscular injections of ascorbic acid (100 mg.) were started on this date; a

total of 23 injections were given. During the course of these injections vision was reduced to 20/40, and multiple new small hemorrhages appeared along the borders of the lesion. The injections of ascorbic acid were discontinued, and sodium-nitrite injections were again resumed, the dosage now being gradually increased to 150 mg. Again there was gradual improvement in vision, and the hemorrhages gradually disappeared. A total of seven injections was given over a period of 13 days, at the end of which time vision was 20/30, and most of the hemorrhages had become absorbed. During the ensuing three weeks the patient was given orally, 150 mg. of nicotinic acid and 65 mg. of phenobarbital in divided doses. He was discharged from the Hospital on August 23d, at which time vision was 20/15, no hemorrhages were present, and the lesion was approximately a third smaller than on admission. He was last seen on December 7th when vision was 20/15; the lesion was somewhat smaller but there was a small hemorrhage at the temporal border of the mass. The vessels appeared normal.

CASE 9. R. L. G., a chief carpenter's mate, aged 31 years, entered the Hospital on July 24, 1944, complaining of diminished vision in the right eye of which he had first become aware seven days previously.

*General examination* revealed a blood pressure of 120 systolic and 80 diastolic. Special examinations revealed no evident foci of infection in the sinuses, throat, or prostate gland. Roentgenograms of the chest, paranasal sinuses, and teeth disclosed no pathologic changes. The Kahn test of the blood, agglutination test for brucellosis, and urinalysis gave negative results. Tuberculin test (second strength P.P.D.) gave a moderately positive re-

action. The blood count was 4,920,000 red cells and 11,050 white cells, with 47 percent polymorphonuclears and 45 percent lymphocytes.

*Ocular examination.* Vision with the right eye was 20/70. This eye presented (fig. 15) a grayish, elevated, disciform lesion in the macular area about the size of the optic disc, with vessels coursing in front of it, and surrounded by a circular area of deep edema. Numerous deep and superficial hemorrhages were scattered irregularly about the lesion and some were in front of it. The retinal vessels were normal except for three small macular arterioles which showed irregularities in the lumens. Superior and superior nasally to the disc were two small, flat, grayish areas of healed choroiditis. The anterior segment was normal. Vision in the left eye was 20/20. This eye appeared normal except for a number of small, circular, choroidal scars scattered about the disc nasally and inferiorly and one just above the macula.

During the first week of hospitalization vision spontaneously improved to 20/30, and hemorrhages became less numerous. Treatment was then started, consisting of nicotinic acid by mouth (150 mg. daily) for three weeks and sodium nitrite by vein (100 mg. daily), but without benefit. As a matter of fact, vision was gradually reduced to 20/70, and hemorrhages became more numerous. The patient was last seen on September 26th, when vision was 20/70; there was no material change in the appearance of the lesion except that a few whitish punctate exudates had appeared inferior to the lesion.

CASE 10. M. F. S., a seaman, first class, aged 33 years, entered the Hospital on September 20, 1944, complaining of gradual impairment of vision in the left eye and distortion of objects.

*Physical examination* disclosed a blood pressure of 138 systolic and 80 diastolic. No apparent foci of infection were present. Roentgenograms of the chest showed no pathologic changes. The white blood count was 6,800 cells with 50 percent segmented neutrophils, 49 percent



Fig. 16 (Lucie). Case 10. Ophthalmoscopic appearance of the left eye; vision 20/20.

lymphocytes, and 1 percent eosinophiles. The Kahn test of the blood and agglutination test for brucellosis gave negative reactions. There was a moderate reaction to tuberculin (second strength P.P.D.).

*Ocular examination.* The right eye was normal with vision of 20/15. Vision with the left eye was 20/20, but the objects appeared elongated and the right borders concave. This eye presented a greenish-gray, elevated, roughly round lesion, about three-fourths the size of the disc, surrounded by an area of subretinal edema and located just temporal and inferior to the macula (fig. 16). Several of the vessels coursed in front of the lesion. Two small vessels, branches of the superior and inferior temporal arteries, showed local constrictions and strong

pulsations. No hemorrhages were present. There was a corresponding paracentral scotoma.

Treatment consisted of intravenous administration of sodium nitrite (100 mg. per day) and nicotinic acid (150 mg. per day) by mouth. At the end of three weeks there was no apparent change in the lesion or vessels and no hemorrhages had appeared. Vision was still distorted but it had improved to 20/15. There was no further change two months after admission.

#### COMMENT

The histologic evidence thus far presented, while insufficient to allow far-reaching conclusions to be drawn, suggests nevertheless that senile and juvenile disciform degeneration may be different degrees of the same disease.

The pathologic picture in senile disciform degeneration has been described by Behr,<sup>7</sup> Rintelen,<sup>8</sup> Braun,<sup>9</sup> Verhoeff and Grossman,<sup>3</sup> Sandoz,<sup>10</sup> Brown,<sup>11</sup> and others, and a good summary is given by Duke-Elder.<sup>12</sup> It consists at first, of a large mass of hemorrhage located between the pigment epithelium and lamina vitrea, which apparently originates in the choriocapillaris and extravasates through tears in the lamina vitrea. Later the hemorrhage becomes organized so that the final picture is that of a mass of connective tissue, proliferated pigment cells, and blood vessels. Hyaline degeneration and even bone formation may take place. The retina is usually spared except for secondary degenerative changes. In most cases sclerotic changes in the choroidal blood vessels and occasionally lymphocytic infiltration of the choroid are present.

The picture in juvenile disciform degeneration, as shown by Verhoeff and Grossman and as here presented by me, consists primarily of serum exudate between Bruch's membrane and pigment

epithelium which also originates in the choriocapillaris and extravasates through minute tears in the lamina vitrea. The serum may or may not become organized, depending on the severity and the duration of the condition. In Verhoeff and Grossman's case little organization took place, whereas in mine organization was more marked. In Terry's case, on the other hand, there was a more severe reaction than in either of our cases, apparently being identical to the picture of senile degeneration, except for arteriosclerosis. Gifford and Cushman's case is difficult to evaluate owing to associated retinal changes, but it may well represent a stage between Terry's and my case.

While Verhoeff and Grossman's case, owing to the patient's advanced age, may not represent, in the accepted sense, the true picture of juvenile disciform degeneration, it nevertheless proves that a lesion almost identical to the juvenile type does occur in old age, in the absence of arteriosclerosis. Thus we have, both in advanced age and in youth, an almost identical histologic picture which varies between the two extremes; namely, a mild lesion consisting mainly of serum exudate on the one hand, and an advanced lesion with hemorrhage and connective-tissue organization on the other. The chief difference appears to be that of arteriosclerosis, which is usually present in senile and absent in juvenile degeneration, but which is also the usual finding expected in old age and youth. It seems therefore reasonable to assume that both the senile and juvenile disciform degenerations are one and the same disease, dependent upon similar etiologic factors, whose degree of severity is influenced by preëxisting vascular sclerosis.

What etiologic factors play a part in the causation of this serum exudation is a matter of speculative interest. Duggan<sup>13</sup> believes that disciform degeneration and

choroidosis centralis serosa or central angiospastic retinopathy are all lesions due to increased capillary permeability and that all substances are possible etiologic agents which by virtue of their presence (histamine, and other agents) or their absence (acetylcholine, cevitic acid) can cause either arteriolar spasm or increased capillary permeability or both. Be this as it may, the clinical evidence of associated vascular disease of the retinal vessels in some of the cases here presented suggests that the exudation may be the result of some local neurovascular disturbance. The histologic evidence here presented, however, leaves little doubt that the primary seat of the reaction is in the choroid and not in the retina.

The common belief that complete recovery may be expected in every case of juvenile disciform degeneration, within a few months, is not supported by this group of cases. I believe that the final outcome depends greatly on the severity and the duration of the condition. If little or no organization of the serum takes place, recovery may be expected within a reasonable period of time. However, if organization is marked, as demonstrated histologically in one of the cases, complete recovery may never take place.

#### SUMMARY AND CONCLUSIONS

The clinical and ophthalmoscopic ob-

servations in 10 cases and the microscopic findings in one case of juvenile disciform degeneration of the macula are described.

The patients were white men between the ages of 19 and 37 years, and in the active service of the Navy. In four of the men the right eye was affected, in five the left eye, and in one, both eyes.

The lesions varied in size from one-half to 3 disc diameters, and in color from dark-brown to gray. They were usually surrounded by hemorrhages and deep edema, and in three of the cases by whitish exudates. In some of the patients local constrictions of the retinal vessels were present. Vision varied from 20/20 to 4/200.

The microscopic examination revealed a mass of organized tissue between the lamina vitrea and pigment epithelium, not unlike that seen in senile disciform degeneration. Serum exudate surrounded the mass of tissue. The lamina vitrea was ruptured, the choroid was somewhat thickened and infiltrated with lymphocytes.

It appeared that the serum had originated in the vascular bed of the choroid and had undergone organization.

It is suggested that both the senile and juvenile forms of disciform degeneration are merely different degrees of the same disease, dependent upon some neurovascular disturbance.

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## TOTAL RECONSTRUCTION OF THE UPPER LID (BLEPHAROPOIESIS)

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When the upper lid is torn off or must be removed on account of malignancy, the main protection of the eye is gone, since it normally covers and protects approximately three quarters of the cornea when in the primary position. The cornea cannot long remain clear and function normally if its protecting cover is missing.

Structurally, functionally, and surgically the lids may be divided into two layers: the inner one, comprising the conjunctiva and tarsal plate with its attached levator muscle, and the outer layer, comprised of the skin, lashes and all structures superficial to the tarsus. The reconstruction of each of these layers must be planned to provide a proper lid which will function well and have a good cosmetic appearance.

The upper lid is much more difficult to reconstruct totally than is the lower lid. Fortunately, the indications are much less frequent, since malignancy is 10 times more frequent in the lower lid. The upper lid is more protected by the brow and orbital margin from traumatism than is the lower; it is also more flexible and elastic, a characteristic which permits

greater injury with less damage than is the case with the lower lid.

### GENERAL DISCUSSION OF UPPER-LID RECONSTRUCTION

The inner layer of a new upper lid should be such that it provides a smooth mucous epithelial lining which comes down over the cornea to spread the secretions over it. For this purpose no substitute acts so efficiently as normal conjunctiva. When normal conjunctiva cannot be found, other mucous membrane may be used to line the lid. Skin should never be used to line the lid where it will come in contact with the cornea, for the cornea may be damaged owing to the rough debris from desquamation. Normally, the mucus secreted by conjunctival glands is mixed with secretions from the lacrimal, and meibomian glands, a small amount of sebaceous secretion, and perspiration from the glands along the lid margin in order to produce a lubricating fluid that protects the cornea and conjunctiva and allows the lids to slide freely, without friction or irritation. The aim should be to duplicate as nearly as pos-

sible in the new lid the tissues that produce this ideal fluid. A certain amount of it disappears by evaporation and the remainder is drained off through the lacrimal passages. When the upper lid is absent the conjunctiva becomes inflamed, thickened, and rough, and loses its luster from lack of protection and consequent excessive evaporation. The vitality of the corneal epithelium is endangered and ulcerations form when it remains thus exposed.

The upper lid must not only cover the cornea and bulbar conjunctiva but must be movable so that it can sweep up and down on the cornea and conjunctiva and thus constantly renew the fluid film over the eye. Its power of elevation must be sufficient to prevent the lid from obstructing the pupillary area to allow for vision and to be cosmetically pleasing. The lower border of the upper lid should arch evenly, traversing the cornea at about the junction of the middle and upper thirds. The function of the levator for elevation of the lid is important. The function of the fibers of the orbicularis, particularly the portion near the lid margin, is of little importance. When the normal tonicity of the levator is inhibited, as in attempting to close the lids or in sleep, the upper lid will fall of its own weight unless it is held up by scar tissue or is too short vertically.

The conjunctiva of the upper lid should be backed by a firm plate to give rigidity and shape to the lower part of the lid, as a substitute for the tarsus. This plate should be thin and shaped to fit the eyeball, and to it the levator should be attached. For this purpose there is nothing superior to tarsus itself, with its covering layer of conjunctiva. A piece of tarsus of sufficient dimensions can usually be obtained from the opposite upper lid, where considerable additional conjunctiva is frequently available to form the

upper fornix. When tarsus is not available a piece of ear cartilage may be utilized onto which may be pregrafted a layer of mucous membrane. For this latter purpose buccal mucous membrane should be implanted into a prepared pocket directly onto the concave surface of a portion of the cartilage of the ear that will provide a piece of proper curvature and of ample size. The mucous membrane is inserted into a prepared pocket, with its raw surface against a suitable concave portion of the ear cartilage and allowed to grow in direct contact with the cartilage. If it is placed on a flat semicircular form before being slipped into the pocket it will heal with a minimum of shrinkage. Three weeks later, when the mucous membrane has grown to the underlying cartilage, the double layer representing tarso-conjunctiva is transplanted to the proper location on the inside of the upper lid as a free graft. The mucous-membrane-lined cartilage thus provides a smooth lining to allow the new lid to fit snugly and to move freely and without irritation over the exposed surface of the eye. Its margins are attached to the conjunctival edge above and below in the same manner as is used when the tarsus (with its closely adherent conjunctival layer) is used.

To protect the inner layer of the upper lid and to allow it to function properly the outer layer must be well planned. The most important consideration for this outer layer is the provision of a thin, flexible, cutaneous layer of sufficient dimensions to provide a fold and to allow the lid to fall sufficiently to meet the lower lid and thus completely cover the eye even during sleep. The cutaneous layer should match the lid skin of the opposite upper lid in dimensions, flexibility, texture, color, and thinness as well as in its architecture.

The lashes on the margin of the upper



lid are functionally and cosmetically important and can usually be quite well provided by utilizing a properly chosen strip of hair-bearing skin from the nasal end of the brow on the same side.

If the nasal and/or temporal canthal angle is undamaged or can be preserved (as in the case reported later, figure 1) its integrity should be carefully guarded, since the presence of normal angles is an

1. Protection from exposure for the bulbar conjunctiva and cornea.

2. Size sufficient to allow for closure in order to protect at least the cornea during sleep, and motility sufficient to spread the conjunctival fluid over the eye by winking and by elevation to uncover at least part of the pupillary area.

3. Externally at least a fairly acceptable match for the opposit upper lid in

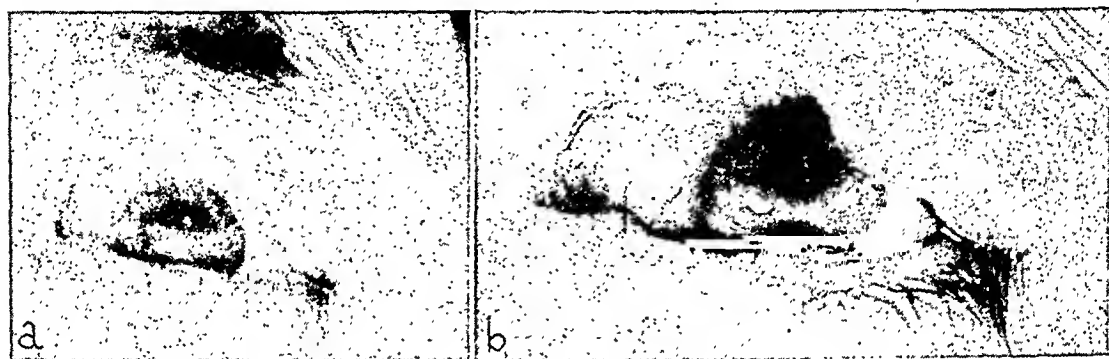


Fig. 1 (Hughes). a, the upper lid of the left eye had been torn off in an automobile accident. A tiny nubbin of upper lid temporally remained so that the canthal angle was preserved. b, enlarged view showing skin of the brow directly continuous with the conjunctiva, with no semblance of any fornix except at the temporal end.

important factor cosmetically. Once they are destroyed it is difficult to duplicate them exactly.

When the lower lid is absent or deformed as well, the reconstruction of a suitable upper lid becomes much more complicated. When both upper and lower lids are entirely absent, the problems are multiplied because of the absence of any nearby lid structure and the larger area to be reconstructed.

One may readily see from what has been pointed out that the reconstruction of a good upper lid is a difficult surgical problem. For an ideal upper lid one should strive to produce a lid which, when completed, will exactly match the normal, but practically one must be contented with somewhat less than a theoretically perfect result.

The new upper lid must provide as a minimum:

respect to color, texture, flexibility, dimensions including thickness (or rather thinness) and vertical length, arching, and so forth.

#### CASE REPORT

Reconstruction of the entire upper lid in the presence of a normal lower lid.

A woman, aged 56 years, had had her left upper lid cut off by flying glass in an automobile accident two years prior to her first visit. The only remaining portion of the upper lid was a tiny nubbin of tissue including four or five lashes at the temporal canthus. The skin just below the brow was directly continuous with the conjunctiva about 2 mm. above the upper limbus, with no semblance of a fornix except for a small area near the temporal canthus where the portion of the lid tissue remained (fig. 1).

The cornea was cloudy from ulceration

and scarring as the result of long exposure.

The lower lid was uninjured.

The other eye was normal. There was a moderate amount of scarring in the nearby areas, partly from the original accident and partly as a result of pedicled flap grafts which had been used in the course of seven operations in attempts to build an upper lid.

The following steps were taken in the surgical procedure: 1. Provide a protection for the eye (blepharorrhaphy). 2. Free graft of skin for the lid to provide the outer layer. 3. Free transplantation of tarsus for the inner layer. 4. Reattachment of the levator for motility. 5. Transplantation of lashes. 6. Incision to make the interpalpebral fissure.

#### STAGE 1. BLEPHARORRHAPHY

One of the prime considerations in this case was the preservation of the eye—

up nasally (fig. 3) and a flap dissected up nasally (fig. 4) and brought across temporally above the limbus (fig. 5); another similar flap was dissected temporally and brought across the eyeball above

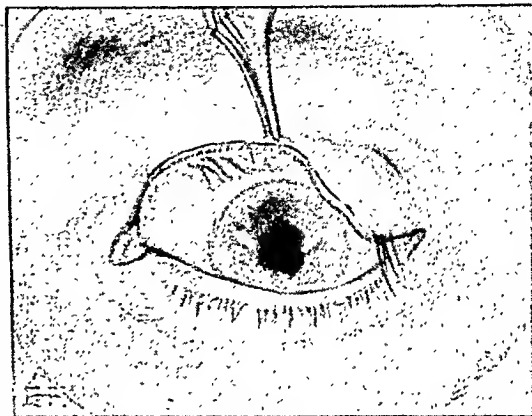


Fig. 2 (Hughes). Line of incision at the junction of the conjunctiva with the skin.

the nasal flap to provide sufficient bulbar conjunctiva above (fig. 6). The lower lid was then split into two layers (fig. 7) by

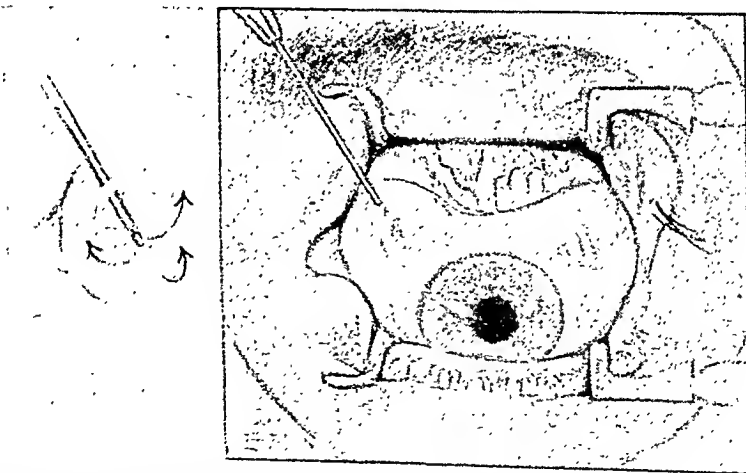


Fig. 3 (Hughes). Subconjunctival injection of fluid to aid in dissecting thin conjunctival flaps. The bevelled edge of the needle is kept forward and the fluid injected superficially.

for this a covering was necessary. The skin of the brow was separated from its attached conjunctiva (fig. 2) above the upper limbus by an incision with a cataract knife, and the skin above undermined for the removal of the scar tissue present. The conjunctiva was ballooned

means of an incision along its border, starting close to the conjunctival edge of the lid margin and then following the line of cleavage provided by the superficial surface of the tarsus down to the lower fornix. This inner layer was incised perpendicular to its margin nasally, just tem-

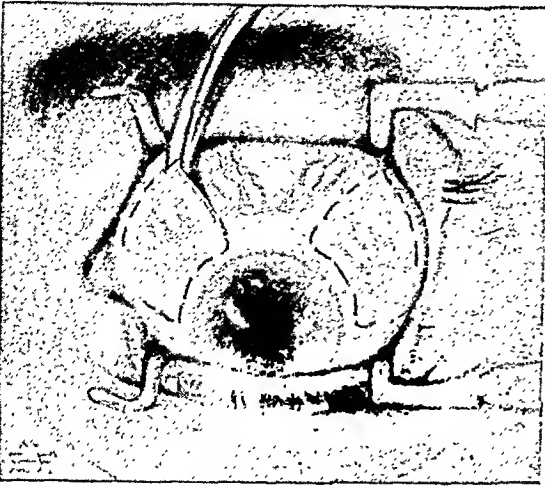


Fig. 4 (Hughes). Outline of conjunctival flaps nasally and temporally.

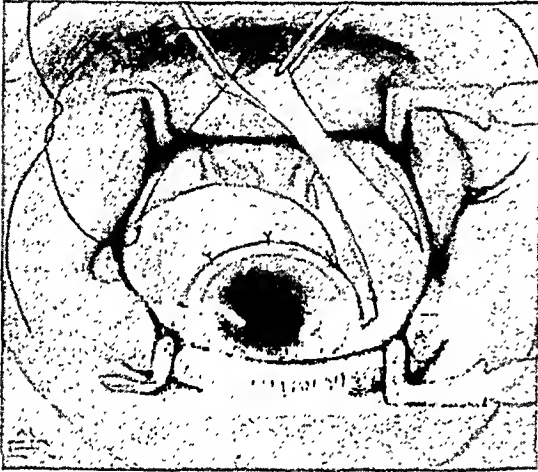


Fig. 5 (Hughes). Nasal flap anchored in position. Temporal flap freed.

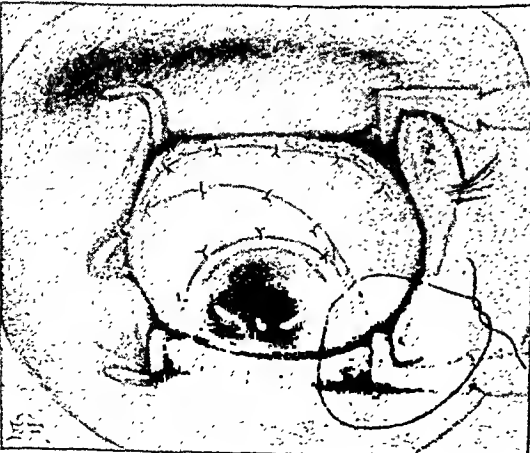


Fig. 6 (Hughes). Temporal flap sewn in position to provide bulbar conjunctiva above.

poral to the punctum and temporally opposite the free end of the nubbin of upper-lid tissue remaining at the lateral canthus. The inner layer thus being freed (fig. 8) except for its conjunctival attach-

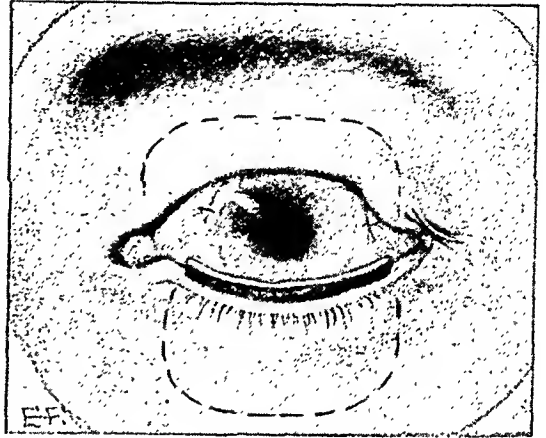


Fig. 7 (Hughes). Lower lid split into its two layers.

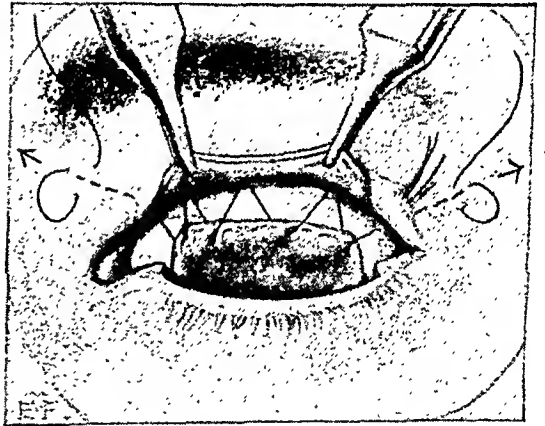


Fig. 8 (Hughes). The tarso-conjunctival layer of the lower lid was united by a continuous black-silk suture brought out and locked externally at each end.

ment below was brought up and sewn to the upper part of the eyeball by means of a continuous suture, brought out at each end and locked.\*

\* It is important when using this type of suture to see that the ends are firmly locked and that each loop of the suture is pulled up snugly to approximate accurately the edges of the tissue and keep them in apposition. Failure to keep the edges in accurate approximation may lead to total failure of this procedure.

The smooth conjunctival lining to protect the cornea was now provided and it was, of course, necessary to cover this by an epidermal layer. This latter was done by uniting the lash border of the lower lid to the cut edge of the skin which had been freed and undermined above (fig. 9) by means of a subcuticular stitch. To allow the lower lid to stretch up so far it was necessary to undermine it well below. The final arrangement was then as seen in cross section in figure 10.

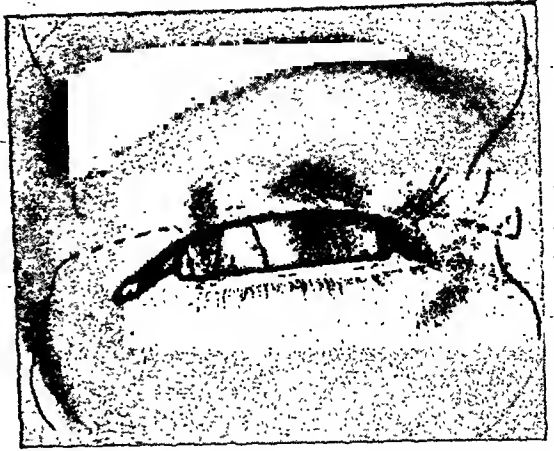


Fig. 9 (Hughes). Subcuticular suture to unite the cutaneous layers.

A double layer of perforated celloid to which was applied a thin layer of 5-percent sodium-sulfathiazole ointment was placed over the area and a pressure dressing applied. This was left in place for five days and then reapplied. It was changed every four days for a period of three weeks. Firm pressure was continued with tightly packed fluffed gauze held in place with adhesive and a head bandage for the first two weeks; for the third week with adhesive only. If the adhesive is warmed slightly at the ends by placing the back of the ends against a warm electric light bulb it will adhere more firmly to the skin.

which was to provide the bed for the graft stretched out well (fig. 12). An area of skin corresponding in size to the exposed area was then removed in its full thick-

#### STAGE 2. FREE GRAFT OF FULL-THICKNESS LID SKIN FROM THE OPPOSITE UPPER LID

Seven weeks after the first stage the tissues had become supple and there was then a complete protecting layer lined by conjunctiva covering the eye. There was only a small amount of skin between the row of lower-lid lashes and the brow so it was necessary to provide extra skin for the ultimate upper lid. A transverse incision parallel to the lashes and about 2 mm. above it (fig. 11) was made through the skin and carried down almost to the conjunctiva.

Scar tissue was excised from the area above to allow the lower-lid margin to be pulled down. A tension suture was placed at the lower part to keep the area

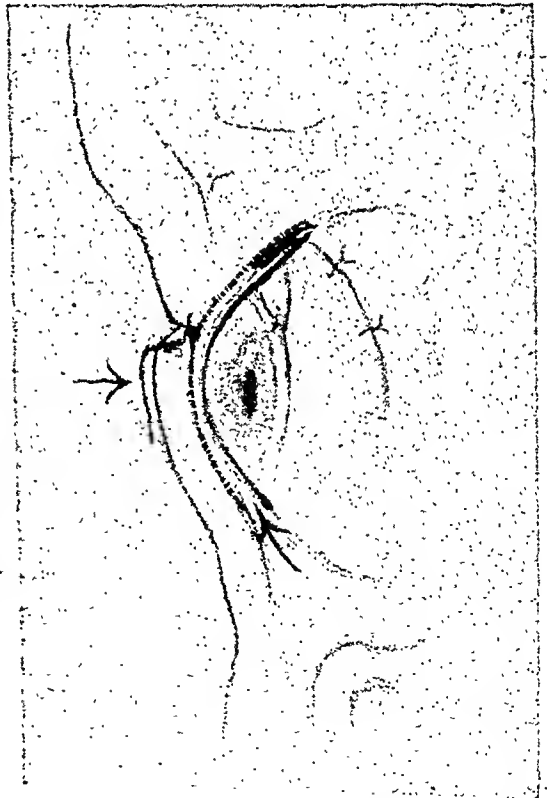


Fig. 10 (Hughes). Cross section of lids showing tarso-conjunctival layer of the lower lid brought up to the upper fornix and the outer layer of the lower lid united to the skin just below the brow. The arrow indicates direction of pressure from pressure dressing.

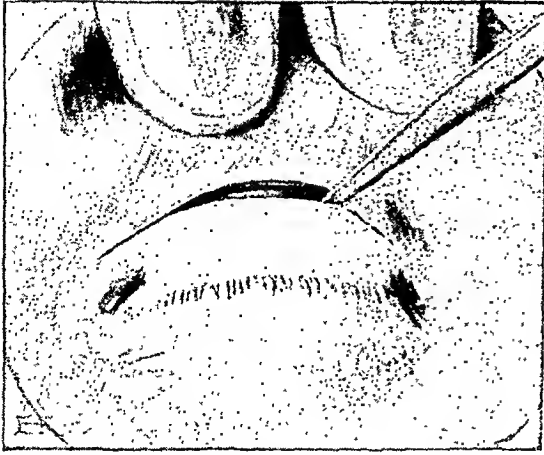


Fig. 11 (Hughes). Second stage. Incision through cutaneous layer.

as possible and free of large clots or foreign substances. It is better to use coagulating diathermy current when possible for sealing off blood vessels than to tie with sutures in order to avoid foreign material in the bed of the graft. If the electro-coagulation is minimal it will not interfere with the taking of the graft. Better still is a small amount of fibrin foam soaked with thrombin applied to the bleeding points. If only a very small

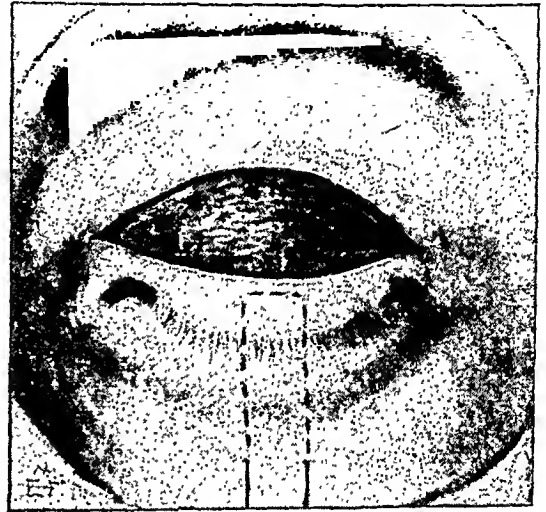


Fig. 12 (Hughes). Bed ready to receive full-thickness lid-skin graft from the opposite upper lid.

ness from the opposite upper lid and sewn (figs. 13a and 13b) in position over the area using numerous, small, fine sutures (7-0 black silk on atraumatic needles makes excellent material for this purpose). These sutures were placed very close to the edge of the graft and in the edges of the host tissue. If tied tightly they may usually be wiped off without resistance at the time of the second dressing, which is usually done on about the tenth day.

The bed for the graft must be as dry



Fig. 13 (Hughes). a, opposite upper lid ballooned up by a very superficial injection of procain hydrochloride and the outlining incision made completely through the skin. b, the graft removed with as little subcutaneous tissue as possible.

amount is used it will not interfere with the viability of the graft.

The double-arm tension suture placed in the middle of the lid margin was pulled snug to put the graft on the stretch and tied externally (fig. 14). A double layer of perforated cilkloid\* with a thin layer of sodium sulfathiazole ointment on its surface was placed over the entire area and fluffed gauze firmly packed over it. This was held in place with a pressure dressing to insure immobility of the tissues and minimal swelling during healing. The dressing was changed in five days and thereafter every four or five days, continuing the pressure for two weeks,

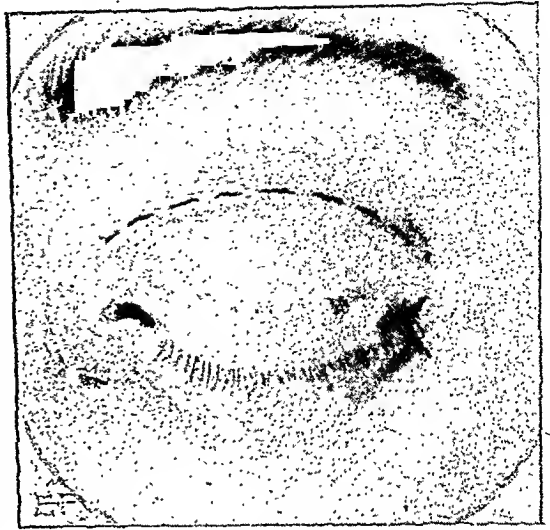


Fig. 15 (Hughes). Third stage. The line of the superficial incision down to the conjunctival layer is shown. The outline of the skin graft was barely visible.

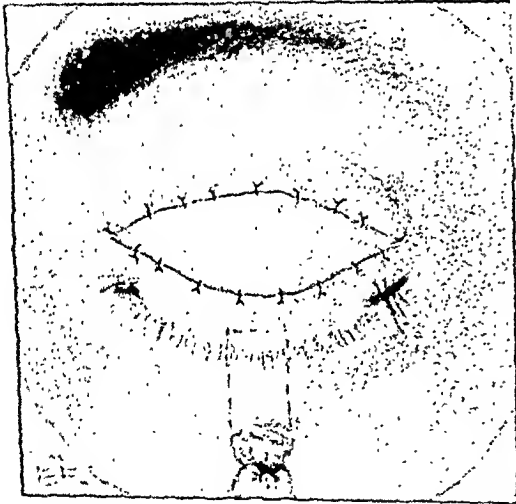


Fig. 14 (Hughes). Graft sewn in position with very fine, closely applied tiny silk sutures.

after which the dressing was somewhat less tight for another week.

### STAGE 3. TRANSPLANTATION OF TARSUS FROM THE OPPOSITE UPPER LID

Seven weeks later a transverse cutaneous incision was made at the upper border

\* If the cilkloid is soaked for a few seconds in ethyl alcohol (not 70 percent) it becomes quite pliable. If left too long in the alcohol it completely dissolves. As soon as it becomes sufficiently pliable the excess may be washed off with boric acid.

of the free graft (fig. 15) and the dissection carried down subcutaneously to the lower border of the upper lid, just parallel to the row of lashes of the lower lid. The incision was then carried through the inner conjunctival layer from side to side. (fig. 16). The conjunctival edges

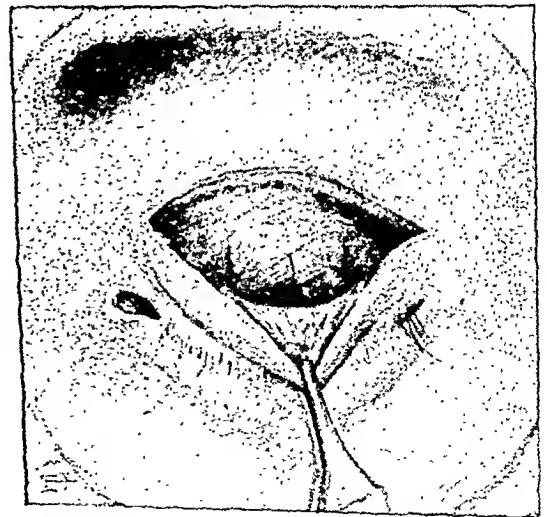


Fig. 16 (Hughes). The cutaneous layer has been undermined and retracted downward. The incision through the conjunctival layer was made transversely at the lower portion of the exposed area just above and parallel to the row of lashes of the lower lid.

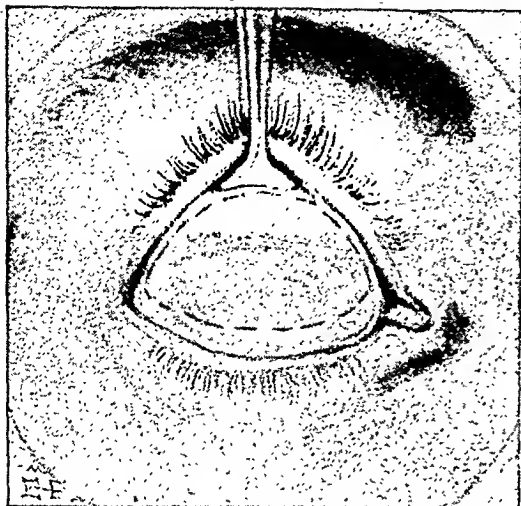


Fig. 17 (Hughes). The conjunctiva of the opposite upper fornix was ballooned up to facilitate the removal of the tarsus with the adjoining conjunctiva above.

were separated sufficiently to receive a free tarso-conjunctival graft from the opposite upper lid.

The opposite upper lid was then everted, and a transverse incision made through the tarsus parallel to, and  $1\frac{1}{2}$  mm. from, the lid margin. The conjunc-

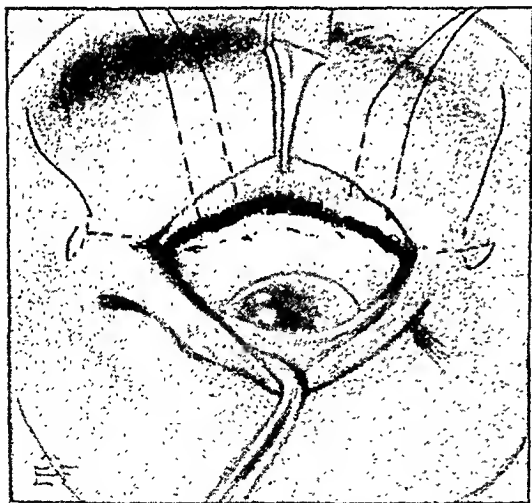


Fig. 18 (Hughes). The tarsal edge of the free tarso-conjunctival graft is held up to show (1) the conjunctiva united above by means of a continuous suture brought out externally and locked at each end, and (2) the double-armed sutures placed to retain the fornix during healing.

tiva of the upper fornix was ballooned up with procain hydrochloride, and a considerable amount of conjunctiva was left attached to the tarsus when it was dissected free in order to provide sufficient conjunctiva when inserted to form the fornix above (figs. 17 and 18). The upper margin of conjunctiva of the fornix was secured by means of a continuous silk suture brought out and locked at each end. Two double-armed sutures were passed through the conjunctiva just above the upper border of the transplanted tarsus and brought out through the upper

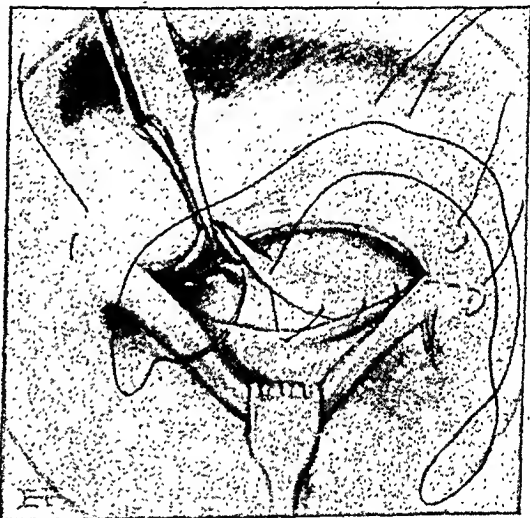


Fig. 19 (Hughes). The lower tarsal margin is being united to the palpebral conjunctiva below by means of a continuous suture locked externally at each end.

lid (fig. 18) ready to be tied over pegs which, when pulled tight, held the conjunctiva up to retain the fornix. The lower border of the tarsus was then attached to the lower margin of the original conjunctival incision by means of another continuous suture brought out and locked at each end (fig. 19). The skin incision was closed by continuous (or interrupted) fine, black-silk sutures which picked up the deeper tissue each time to hold it firmly down along the line which would later be the fold in the



upper lid. The fornix-retaining sutures were tied over pegs (fig. 20).

A similar pressure dressing was applied to the area and kept on for a similar period of time.

#### STAGE 4. REATTACHMENT OF THE LEVATOR

Eight weeks later under local anesthesia an incision was made along the line of the fold in the upper lid down to the eyeball above the upper fornix. During the dissection the position of the fornix was identified by passing a muscle hook under the lid and pushing it upward, to avoid injury to the newly transplanted tarsus and prevent button-holing

tendon was attached was completely freed it retracted into the space between the upper orbital margin and the superior rectus muscle.

The latter muscle is frequently uncovered during this type of dissection for

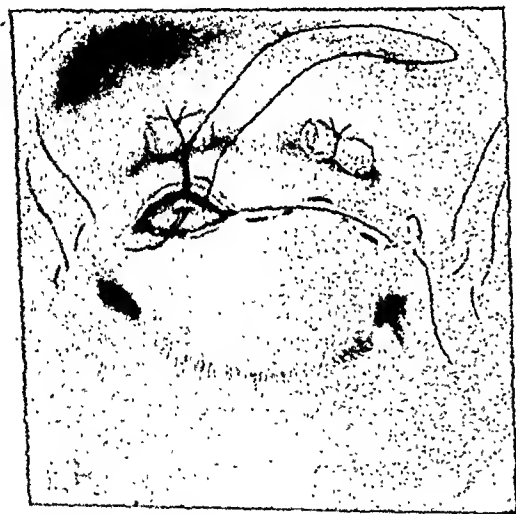


Fig. 20 (Hughes). Closure of the incision picking up the fascia to anchor it firmly for the purpose of forming the fold in the lid.

the conjunctival layer. Subcutaneous scar tissue was removed along the upper orbital margin. Keeping close to the orbital roof, a layer of tissue was dissected free which was in a location usually occupied by the levator. By freeing this layer up and inducing the patient to open the other eye widely the action of the levator on the tissue could be easily identified. When the layer of tissue to which the aponeurosis of the levator

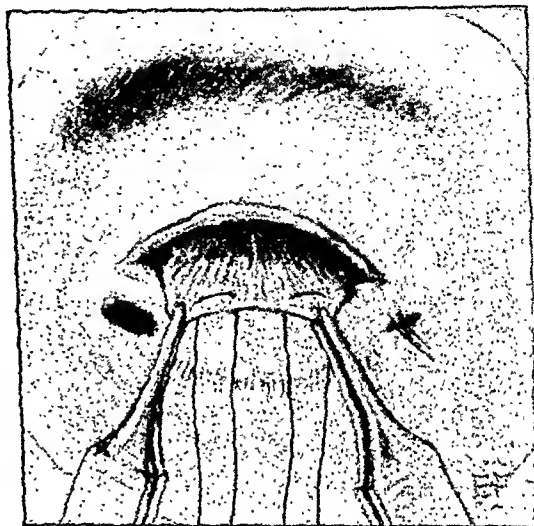


Fig. 21 (Hughes). Fourth stage. The aponeurosis of the levator of the upper lid has been separated and two double-armed sutures placed through it which will anchor it to the underlying tarsus.

the removal of scar tissue. One must be careful in injecting the procain-hydrochloride solution not to put it deeply into the orbit or into the region of the active muscle fibers of the levator in order to prevent a paralysis of the muscle, since it is particularly by the activity of this muscle that the severed aponeurosis of the levator may be accurately identified and sewn back into position onto the anterior surface of the upper tarsus.

Two double-armed sutures were passed through the aponeurosis from without (fig. 21), brought down to pick up a superficial bite of tarsus tissue, and then brought out through the skin of the upper lid near its margin and tied over separate rubber pegs. These sutures should be tied firmly, but not tightly enough to produce local necrosis from pressure. The skin



incision was then closed in the manner described under stage 3 (fig. 22), and a similar dressing applied.

Pressure was maintained for about 10 days and a light dressing thereafter. In

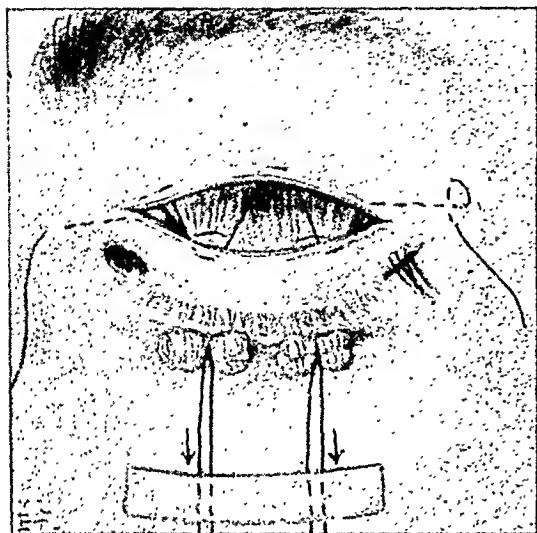


Fig. 22 (Hughes). The aponeurosis of the levator has been brought down and anchored to the anterior tarsal surface. The skin closure as after stage 3.

applying the dressing care was taken that the skin just below the line of the incision in the upper lid was held firmly in place. This was done by placing a moderately tight roll of gauze about the size of a pencil transversely along the line of the incision to make the skin tightly adherent over the tarsus to form and maintain the fold in the upper lid. The action of the levator on the upper lid was easily demonstrated by asking the patient to open the opposite eye widely.

#### STAGE 5. LASH TRANSPLANT

A trough of a length corresponding to the lashes of the opposite upper lid was formed to receive a graft from the brow. A hair-bearing strip of skin was then dissected from the nasal end of the brow on the same side in such a location as to provide hairs of the best direction. Usu-

ally the hairs that provide the best lashes are those at the nasal end of the brow near its lower margin. Here the hairs are usually not so heavy nor so long as elsewhere in the brow and they emerge from the skin in a direction more nearly at right angles to the long axis of the brow. A hair-bearing strip of skin was outlined 2.5 mm. wide and of sufficient length to provide a row of hairs comparable in length to the row of lashes of the normal lid of the opposite eye. In measuring this, one must take into account the convexity of the margin of the lid when in its normal relation to the underlying eye.

In making the incision in the brow the skin incision was made so as not to cut across the roots of the hairs of the brow. The incision was, therefore, made obliquely and was slightly wider in the deeper tissues than at the surface. It went deeply enough to escape injuring the root bulbs of the hairs. In order to prevent accidental dropping of the graft, one end and the two sides of the hair-bearing strip of skin were severed and a suture (7-0 silk) passed through the skin edge at the

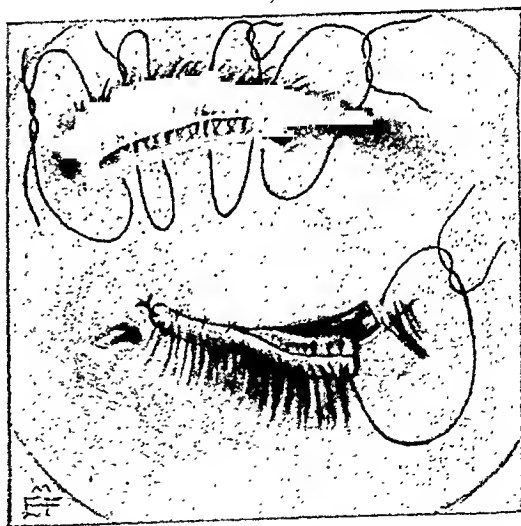


Fig. 23 (Hughes). Fifth stage. Lash transplant, a hair-bearing strip of skin from the brow of the same side is accurately sewn in position with fine black-silk sutures.

free end, only a tiny bite of skin being taken. This suture was passed through the skin at the end of the graft bed, the original nasal end of the strip being kept nasal in its new position to maintain the direction of the hairs in the graft upward, away from the lid margin and slightly temporally. The graft was then completely severed from its original position and the end suture already placed was pulled tightly and tied. The other end suture was then placed and the middle sutures on the upper and lower margin of the graft were next in order. Other fine sutures, placed closed to the margin of the skin of the host area and of the graft, were inserted and tied (fig. 23). In handling the graft, care was taken not to traumatize any more cells than was necessary. The graft was handled by means of the suture and by picking it up by the lashes themselves. When it was necessary to pick up the skin edge for the purpose of placing sutures only the finest forceps and the smallest bites were taken.

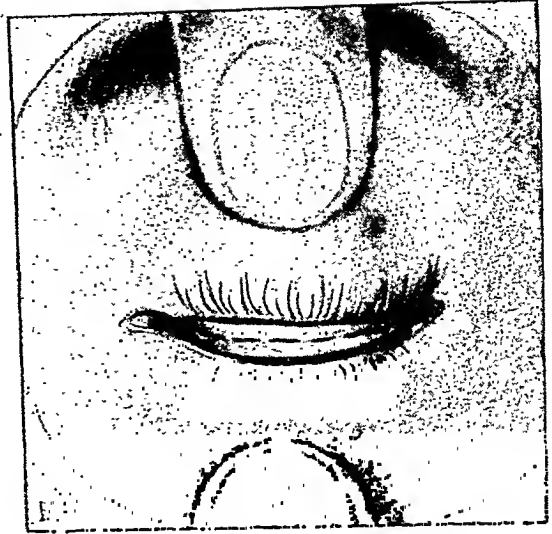


Fig. 24 (Hughes). Sixth stage. Incision for interpalpebral fissure between the two rows of lashes. The superficial layer has been incised with a cataract knife. The inner layer is more easily incised with scissors.

lashes. The skin was incised down to the tarsus with a cataract knife (fig. 24), and the tarsal incision then made with a scissors.

When the lateral canthus has been included in the original blepharorrhaphy the length of the incision should be slightly longer than the normal fissure of the opposite side in order to allow for some adhesion, which usually takes place temporally. To minimize this growing together of the newly opened fissure, few sutures are necessary, one in the angle itself and one or two near the temporal canthus in the upper and the lower lid margin to approximate the conjunctiva

#### STAGE 6. INCISION OF THE BLEPHARORRHAPHY TO PRODUCE A LID FISSURE

As soon as it was seen that the lashes were growing well, and the skin and tissues of the lid were as supple and free of scar tissue as possible, and there was sufficient skin to allow for closure when the lids were opened, a transverse incision was made between the two rows of

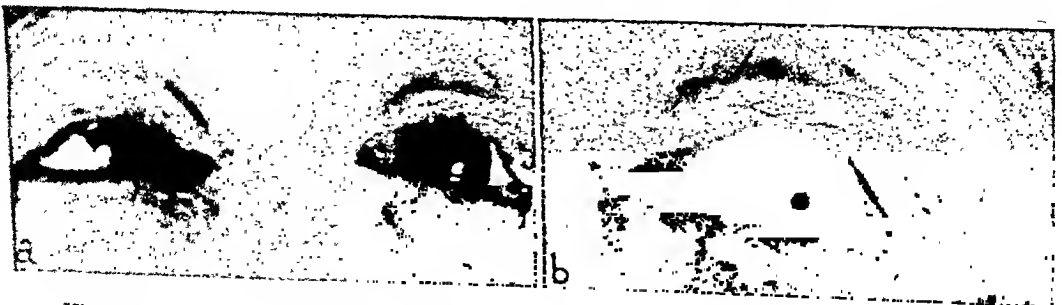


Fig. 25 (Hughes). Final condition of the lids. a, both eyes; b, left eye showing detail.

and the skin so the raw surfaces will not adhere.

Usually no sutures are necessary along the remainder of the lid margins. A light dressing is applied which is changed daily. Frequently the lid margins adhere on the first dressing or two, and must be pulled apart. After four or five days no dressing is necessary. There is usually a moderate amount of discharge present on the dressings.

The final result is shown in figure 25.\*

#### DISCUSSION

This method of rebuilding an upper lid accounts for all of the important features discussed earlier in this paper.

The tarso-conjunctival layer is provided by means of a free graft of tarso-conjunctiva from the opposite upper lid. The lid skin is provided by a full-thickness graft from the skin of the opposite upper lid, supplying skin which matches normal lid skin in every way (area, texture, color, thickness, and flexibility).

\* A moving picture depicting the various steps in this procedure is available on application to the author.

Lashes are provided which in the upper lid are important cosmetically and functionally. Motility is provided for in the normal manner by using the levator tendon. No visible facial scars are produced and the safety of the eye is at all times guarded by keeping the cornea in contact with its normal protection; that is, the conjunctiva of the inner surface of the lid.

This method is applicable only in cases wherein there is a relatively normal opposing lower lid and a normal opposite upper lid. The indications for it are, therefore, not common, but when it is indicated it provides a method by which a satisfactory upper lid may be produced.

The patient is not able to close her lids completely, but during sleep the cornea is protected by the new upper lid. The eye is white and the cornea is now free of irritation and ulceration. There are some corneal scars as the result of the severe exposure keratitis she presented when first seen. A year has now elapsed since the lids were opened.

*131 Fulton Avenue.*

## CATMIN LENSES\*

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*Chicago*

Catmin lenses are image-minifying lenses which act on the principle of a reversed telescopic lens. The lens minifies images about 23 percent. They are made in an all-glass and also in plastic type. The catmin lens is of special value in some cases of unilateral aphakia as an aid to binocular vision, which is illustrated by the case reports in this paper. The disadvantages are (1) appearance, which is similar to a high myopic lens, and (2) the restriction in the visual field, which is reduced about 23 percent.

Patients are seen with well-developed cataracts in one eye and a normal lens in the opposite eye. This may be due to undetermined natural causes or to trauma. In either event, the patients present themselves for restoration of vision in the affected eye. Removal of the affected lens does not fully correct the visual defect because of the differences in refraction and in image size in the two eyes. While the two images seen by the patient do not represent diplopia as seen in paralytic muscular disease, the patient complains of double vision. The defect could be remedied by the use of contact lenses. However, in some cases contact lenses cannot be used and catmin lenses may be of some value to the patient and therefore have been used to provide binocular vision in patients with unilateral aphakia. In many cases a secondary divergence has occurred following the unilateral loss of vision.

Ten cases have been selected from the files of the late Dr. Sanford R. Gifford to illustrate the use of the catmin lens. These cases are of patients having uni-

lateral developmental cataracts who elected cataract extraction and whose vision subsequently was corrected with catmin lenses in order that they might obtain binocular vision. In a number of the cases lens extraction was performed following trauma and subsequently the patients were fitted with catmin lenses that they might obtain binocular vision.

The traumatic cases were in young children from 5 to 16 years of age, and one is a case in a person, 40 years of age, who had lens opacities in only one eye.

The fitting of catmin lenses is not difficult. The procedure followed after lens extraction is to refract the patient in the ordinary way with trial-case lenses. When the refraction stops changing, the prescription, as determined by the trial-case findings, is written for the catmin lens, the distances between the posterior surface of the lens and the eye are noted, and the catmin lens is ordered. The patient wears the catmin lens and returns for examination by the Maddox rod and loose prisms. The amount of prism necessary to superimpose the images for near and distance is noted, and the visual acuity with the patient using the catmin lens is checked to determine whether the addition of more plus or minus power improves the vision. The lens is then returned to the optician for regrinding to add the plus or minus value to the lens. If fusion is not obtained, as is very often the case, the surgeon then can incorporate the amount of prism necessary to superimpose the images in the distance correction of the nonaphakic eye. If the amount of prism necessary is exceedingly large, surgery on the lateral muscles is suggested in order to improve the cosmetic end result.

\* From the Department of Ophthalmology, Northwestern University Medical School.

This surgery is usually performed on the aphakic eye, although the choice of eye makes no difference. After this surgery has been accomplished the amount of prism necessary to superimpose the images is incorporated in the trial-case

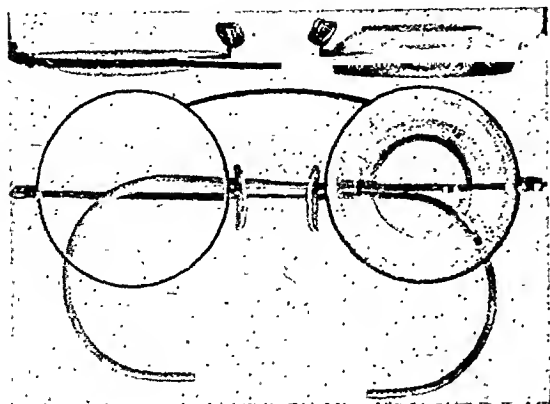


Fig. 1 (Kamellin). Right lens with prism incorporated. Left lens a catmin lens.

findings of the nonaphakic eye. This prism can be changed as the need may arise.

Up to this point the procedures necessary for the correction of distance vision have been discussed; however, if there is difficulty at near, as there usually is because of the loss of accommodation in the aphakic eye, then the addition for near is prescribed as a slipover after the amount necessary has been determined with the catmin lens in place. Iseikonic lenses have been considered in cases of unilateral aphakia; however, they cannot be used to equalize the image sizes because of the great percentage of difference between the size of the aphakic image as compared with the nonaphakic image.

#### CASE REPORTS

*Case 1.* B. R., aged 23 years, first noticed loss of vision in the right eye three years prior to the initial examination. Examination revealed visual acuity with the R.E. to be light perception and projection; with the L.E. 20/25-1. There was

a mature cataract in the right eye, with small precipitates on the cornea and tufts of pigment on the pupillary border of the iris. The right eye diverged 45 prism diopters. There were coronary opacities in the periphery of the lens of the left eye. Tuberculin tests, general check-up, and blood tests gave negative results.

The lens cortex was removed by capsulotomy and corneal expression on August 12, 1940. The patient had a residual fine secondary membrane in the pupillary area after the operation, but the refraction with trial-case lenses with a +12.50D. sph.  $\approx$  +1.50D. cyl. ax. 105° resulted in 20/25 vision.

Because of the divergence, a recession, resection, and advancement were performed on December 28, 1940. After the operation, the patient had some residual divergence and the catmin lens was ordered for the right eye. The diplopia was corrected by a 4 prism-diopter, base-in lens, which was prescribed for the left lens. With the catmin in the frame, the patient read 20/40+1 and with the addition of a -0.37D. sph. from the trial frame the vision was 20/30-2. This correction was incorporated in the catmin lens. The final examination gave the following results: Vision with glasses, R.E. 20/30; L.E. 20/25. Maddox rod, with correction 3 prism diopters, base in, for far, and 10 prism diopters, base in, for near.

*Case 2.* Mrs. H. C. P., aged 55 years, was first seen in December, 1942, because of loss of vision in the left eye. Vision with glasses was R.E. 20/15; L.E. 10/100; refraction improved her vision to R.E. 20/15; L.E. 20/65. There were diffuse posterior cortical lens opacities sufficient to account for the loss of vision. The nerve and macula were normal, and therefore no surgery was advised. Three and one-half months later, the patient returned

with the complaint that her left eye was worse. Vision with correction was R.E. 20/15; L.E. 20/200. Slitlamp examination revealed dense posterior cortical lens opacities sufficient to account for the loss of vision. Lens extraction was advised and was performed on January 27, 1943, on the left eye. The final trial-case find-

revealed vision with the R.E. sufficient for finger counting at one foot with good projection; L.E. 20/20-3 with correction. Slitlamp examination uncovered a mature cataract in the right eye with no precipitates on the cornea. Operation was advised on the right eye and performed on June 20, 1942. Postoperative

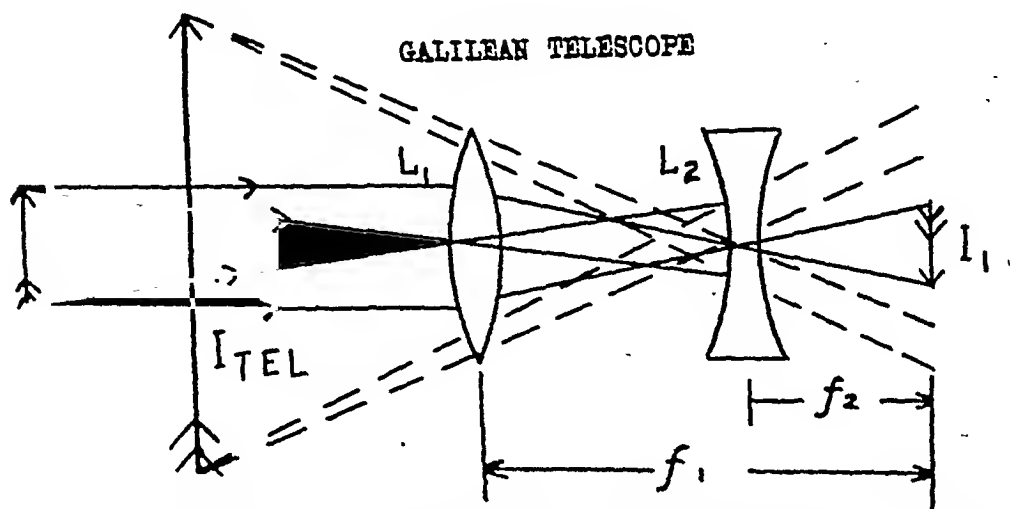


Fig. 2 (Kamellin). Diagram of Galilean telescope. In the catmin lens the object and image are reversed. (Courtesy of The House of Vision, Chicago.)

ings were L.E. +8.00D. sph.  $\approx$  +3.25D. cyl. ax. 167° for vision of 20/25-1. She could read J1 with the L.E. with a +10.75D. sph.  $\approx$  +3.25D. cyl. ax. 167°. The catmin lens was then ordered, and the examination revealed visual acuity R.E. 20/20 and L.E. 20/20. Maddox rod with correction revealed 6 prism diopters, base in, for distance and 20 prism diopters, base in, for near. The addition of plus or minus did not improve the vision. The deviation for near was corrected with a 5½ prism-diopter, base-in lens; the addition for near vision of a +2.75D. sph. over each eye was prescribed in the form of slipovers.

Case 3. Mrs. C. C. P., aged 37 years, noted loss of vision in the right eye. There was no history of injury, inflammation, or the use of drugs. Examination

refraction of the R.E. with a +12.00 D. sph.  $\approx$  +1.50D. cyl. ax. 5° gave 20/20 for reading; with a +3.50 D. sph. addition gave J1 at 13 inches. Maddox rod test with catmin lens gave 16 prism diopters for distance and 6 prism diopters, base down, for the right eye. The diplopia was corrected by a 12 prism-diopter base-in lens, and a 4 prism-diopter base-down lens for the right eye. The vision in the right eye was not improved by plus or minus sphere. The prism equivalent of 12 prism diopters, base in, and 4 prism diopters, base up, was placed in the correction for the left eye, but the patient still continued to have diplopia. Recheck revealed that the diplopia for distance was corrected by an 8 prism-diopter, base-in, and the near vision by a 2 prism-diopter, base-down lens for the right eye, and this was prescribed as

a 6 prism-diopter, base in, and a 2 prism-diopter, base-up, for the left eye. The patient returned in three months for a check-up and examination revealed vision with the R.E. 20/25-3, and with the L.E. 20/15.

Plus or minus sphere over the catmin lens did not improve the distance vision. Slipovers R.E. +2.50D. sph. and L.E. +1.00D. sph. improved the near vision. The patient continued to have a small amount of diplopia which was not so uncomfortable as before.

*Case 4.* Mrs. J. D., aged 55 years, noted loss of vision in the right eye which increasingly diminished over a period of five years. Examination revealed good light perception and good projection in the right eye, and 20/15 vision in the left eye. The right eye had a hypermature cataract. The lens of the left eye had no opacities. Operation on the right eye was advised and performed on November 3, 1943. Visual acuity by trial case with a +3.25D. sph.  $\approx$  +3.00D. cyl. ax. 180° was 20/20-2. A catmin lens was ordered for the right eye and the visual acuity with this correction in place was 20/20-2. The patient was helped slightly by the addition of a +0.50D. sph. in front of the catmin lens. The Maddox rod test resulted in 4 prism diopters, base in, and 2 prism diopters, base down, for the right eye, with the catmin lens in position. Slipovers of +3.00D. sph. for the right eye and +2.50D. sph. for the left eye were then ordered for near; the distance correction for the left eye was ordered with a 4 prism-diopter base-in and a 2 prism-diopter base-up lens in it. The patient continued to have diplopia with this correction so the Maddox rod was rechecked and found to be 2 prism diopters, base in, for distance and no hyperphoria was present. The test revealed that she had less difficulty with a +0.50D. sph.

over the left lens, so the correction for distance on the eye that had not been operated on was reordered with this change in it. This correction gave the patient no difficulty for distance or for near vision.

*Case 5.* Mr. H. C. B. was seen on December 10, 1940, complaining of loss of vision in the right eye. Corrected vision with the right eye was 20/100 and with the left eye 20/20. Slitlamp examination revealed a very dark nucleus in the lens and also distinct opacities under the anterior capsule of the right eye. Lens extraction from the right eye was subsequently performed on July 28, 1941. Examination with a trial case revealed vision with a +13.00D. sph.  $\approx$  +1.50D. cyl. ax. 25° to be 20/15+. A reading addition of +2.00D. sph. was prescribed and permitted J1 to be read. The lens was ordered for the right eye. The patient received this type of lens because he complained of being unable to use the ordinary cataract lens. The test with a catmin lens showed vision of 20/40-2 with the right eye, and with the addition of +0.75D. sph. it was improved to 20/20. Maddox rod revealed 2 prism diopters, base out, and 8 prism diopters, base up, for the right eye. A +0.75 D. sph. was added to the catmin lens and to the correction for the left eye together with a 7 prism-diopter, base-down lens to the correction of the left eye. The patient then stated that the catmin was not so helpful as it had been before. His vision in the right eye was 20/25 with correction. Test revealed that a -0.37D. sph. improved the vision with a catmin lens, so this correction was ordered in the catmin lens for the right eye. Thereafter he got along well until he developed opacities in the left lens which progressed to such a point that operation was indicated.

*Case 6.* Mr. C. H., aged 16 years, gave a history of having been struck in the right eye. There was a traumatic cataract with a large iridodialysis of the outer half of the iris. Examination revealed that visual acuity in the right eye was limited to the perception of hand movements, with good projection in all fields; in the left eye the visual acuity was 20/25+2. When the injured eye quieted down an operation was performed (March 4, 1940) to replace the iris. This was done by grasping the iris and resuturing it to its previous position. The procedure was followed 15 days later by a corneal expression of the swollen lens cortex (March 19, 1940), and this operation was subsequently followed by a discission of the secondary membrane (September 10, 1940). Examination revealed that the fundus had some gray connective tissue in the macular area. Trial-case examination determined that a +9.00D. sph.  $\approx$  +5.50D. cyl. ax. 140° gave vision of 20/50+. The catmin lens was prescribed for the left eye with a prism, base in and base up, incorporated for correction of the diplopia. Plus or minus spheres over the catmin did not improve the vision, which was 20/50+. The diplopia returned and it was impossible to correct it with prisms, for the patient seemed to avoid fusion. He subsequently suppressed the vision in the right eye while reading. However, he was using the catmin lens one hour daily and was advised to return for further checkups.

*Case 7.* B. M., a boy aged 10 years, was hit by a bullet from an air gun. X-ray examination revealed no foreign bodies present in the eye. Visual acuity with the right eye was 20/40; perception of hand movements and good projection with the left eye. The iris in the left eye was adherent to the lens capsule. The lens was

opaque and dislocated. The tension was low. A discission of the lens was performed on July 1, 1939, and the lens subsequently became absorbed. Following complete absorption of the lens cortex, trial-case examination revealed that a +11.50D. sph.  $\approx$  +1.50D. cyl. ax. 75° gave vision of 20/20, with a +3.00D. sph. added for near. The catmin lens was ordered and the patient read 20/40 with it. The addition of a +1.00D. sph. improved vision to 20/25, so a catmin lens was increased by this amount. Diplopia was rectified by a 2 prism-diopter base-up, and 3 prism-diopter base-in lens over the eye that had not been operated on. The left eye continued to diverge and it was necessary to change the prism strength a number of times to correct the diplopia. This increase continued until a 20 prism-diopter base-in lens was required to correct the deviation. Surgery to correct the divergence was suggested, and an O'Connor cinch operation of the left internal rectus muscle and a fenestrating tenotomy of the left externus were performed on July 31, 1943. The residual deviation was corrected by a 3 prism-diopter base-in lens which was incorporated in the correction for the right eye. The patient's vision has remained comfortable since that time.

*Case 8.* A. H., a boy aged eight years, was playing with a button on a string, when it slipped off and struck him in the left eye. Examination revealed that vision with the right eye was 20/30 and that good light perception and projection were present in the left eye. There were remains of a traumatic cataract which filled the pupil. A discission was advised and performed on August 29, 1938. Trial-case test resulted for the left eye in a +12.25D. sph.  $\approx$  +1.50 cyl. ax. 10°, with which vision was 20/25+3. A -.50 D. sph. over the left lens improved the



vision slightly and this correction was ordered for the catmin lens. The diplopia was corrected by a 12 prism-diopter base-in lens, and this was ordered as a slipover. Subsequent checkups revealed that the diplopia was corrected with a 5 prism-diopter base-in lens, and this was ordered for the correction in the right lens. He now has good fusion and good depth perception.

*Case 9.* Mrs. W. O. C., aged 40 years, was hit in the right eye by a piece of metal. When seen, vision R.E. was 8/200, and L.E. 20/15. Cortex was present in the anterior chamber, and the tension in the right eye was 52 mm. Hg (Schiotz). A corneal expression was advised and performed, and a secondary discission subsequently was also done. Trial-case test of the right eye revealed that with a +11.25D. sph.  $\approx$  +1.00D. cyl. ax. 180° vision was 20/20. The right eye subsequently developed a slight deviation, however, the catmin lens was prescribed and the patient had good fusion. The correction for near was added in the form of slipovers, and the patient is now comfortable.

*Case 10.* R. B., aged five years, injured his right eye two years previous to the first examination, and lashes were carried into the eye at that time. Examination revealed a large yellow mass on the iris extending to the pupillary margin and touching the cornea anteriorly. An iridectomy was performed on August 5, 1935; the patient subsequently developed a cataract. This was removed by discission and corneal expression on December 30, 1935. Trial-case examination revealed that

vision with a +12.50D. sph.  $\approx$  +2.00D. cyl. ax. 130° was 20/40 in the right eye. With an addition of +3.50D. sph. he was able to read J2. Occlusion of the left eye failed to improve the visual acuity. Recheck by trial case revealed in the right eye that a +10.50D. sph.  $\approx$  +4.00D. cyl. ax. 115° gave vision of 20/40—, and this was ordered for the catmin lens. Diplopia was corrected by 15 prism-diopter, base-in lens. A -1.00D. sph. added to the catmin improved the vision to 20/30—2. The prism correction was ordered incorporated into the left lens and a slipover of +2.50D. sph. for near was prescribed for the right eye.

#### SUMMARY

##### A. Advantages of catmin lens:

1. Catmin lenses are reversed telescopic lenses which are of value in certain cases of unilateral aphakia in children and in adults in which contact lenses cannot be used to maintain binocular vision.

##### B. Disadvantages of catmin lens:

1. Cosmetically the appearance of the lens leaves much to be desired.
2. The field of vision is restricted about 23 percent when this type of lens is used.

#### CONCLUSION

Catmin lenses are of benefit in many cases for the maintenance of binocular vision and may be added to the armamentarium of the ophthalmologist to be used in those cases in which the individual does not object to the appearance of the lens and also does not object to the restriction in the field of vision and in which contact lenses cannot be prescribed.

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# SUMMARY OF REEXAMINATION OF ORTHOPTIC PATIENTS WITH CONSIDERATION OF PERMANENCE OF RESULTS\*

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For the past five months I have been engaged in a bit of research which has had to do with calling back and reexamining former orthoptic patients. The purpose in mind was the securing of information which would lead to evaluating to some extent the permanence of results gained by orthoptic treatment.

An observation has been brought to my attention during visits to hospital clinics and during the accumulating of material for this report. There is a vast difference in the proportion of various types of cases dealt with in clinic work and in a private office. In an office that deals mainly with private patients we naturally find a greater percentage of phorias and discomfort cases.<sup>†</sup> The clinic patient goes to be treated for the most part for some very evident condition. The private patient goes more routinely for minor conditions as well as for manifest ones. This gives us many uncomfortable adults who must be taken care of, and rightfully so.

In our particular situation it is also a fact that many patients are seen from the Tri-State area. Consequently these patients are not often accessible for rechecking. There are many cases of squint among these Tri-State patients who make the effort to come some distance for good attention in a city, but who cannot be secured for any prolonged treatment. We often experience disappointment in having to be satisfied with a cosmetic result when

everything in us longs to make it a functional one.

May I recommend to orthoptic technicians this checking back-process as a stabilizer as far as hopes and expectations are concerned. It is very easy to become temporarily overconfident when gratifying results appear in groups. It is just as easy to question the value of work done when for a period of time expected results are simply not forthcoming. After reviewing a series of cases a mental settling down takes place, together with the realization that only by continued plodding along, incorporating or discarding new techniques as they are proved, taking ups and downs as they come and profiting by them, is real progress made.

Please bear in mind that the following cases are not presumed to be spectacular in any way. They are but examples of the general run of orthoptic patients seen and treated in ordinary private practice. The photographs are shown not to display orthoptic skill in having secured the results, for every orthoptic clinic can show similar work done. In this discussion the objective is to ascertain the condition of the patient several years later as compared with that at cessation of treatment.

This report is made on the reexamination of 50 orthoptic cases. The time that has elapsed since these patients were treated ranges from two to nine years. These cases have been divided into two groups. In the first group are included some tropia and some phoria cases, but all with demonstrable deviations which at the time were or might later have become disfiguring. Although it is impossible to group cases as identical ones, I have tried to present as far as possible

\* Presented before the Symposium on Orthoptics, American Academy of Ophthalmology and Otolaryngology, at Chicago, in October, 1944.

<sup>†</sup> I should mention here that ours is a central office to which patients are referred by ophthalmologists of the entire city and surrounding area.

cases that come under general classifications rather than those with unusual individual peculiarities, for these would be more generally indicative of what permanent results can be expected from orthoptic treatment.

Six patients with accommodative convergent squint were called back for examination. The résumés will necessarily be brief.

*Case 1.* B. J. R., a child aged five years at the time of her first visit, 10 years



Fig. 1 (Robinson). Case 1. Accommodative convergent squint at five years of age. Fig. 2, same case 10 years later, following orthoptic treatment.

ago in July, 1934, had an accommodative convergent squint of  $20^{\Delta}$  (fig. 1). Her mechanical deviation had been corrected by a recession of the right internal rectus. Vision of her left eye was corrected to 20/20 by a  $+3.50D.$  sph., and the vision of her right eye was 20/70 with a  $+3.50D.$  sph.  $\approx +3.00D.$  cyl. ax.  $90^{\circ}$ .

Orthoptic treatment combined with occlusion was administered for 10 months. Six years later the patient returned and was treated for three months.

An examination in June, 1944 (fig. 2), revealed corrected vision 20/15 and 20/20. She had orthophoria for distance and  $3^{\Delta}$  of exophoria for near with and without glasses. Prism divergence was  $5^{\Delta}$  and prism convergence  $22^{\Delta}$ .

This result was obtained and maintained with surgery, refraction, and orthoptic treatment, in addition to the time and effort expended by the patient. This

last factor should not be minimized. From all indications, neglect of any one of these factors would have prevented the attainment and permanence of the present result.

*Case 2.* F. D., a child four years of age, was seen eight years ago. His original condition presented an accommodative squint of  $30^{\Delta}$ . Vision of the right eye could be corrected to 20/20 with a  $+3.00.$  sph.  $\approx +1.00D.$  cyl. ax.  $90^{\circ}$ ; vision of the left eye could be corrected to 20/100 with a  $+4.50D.$  sph.  $\approx +1.00D.$  cyl. ax.  $90^{\circ}$ .

Treatment consisted of supervised occlusion for seven months and orthoptic training for the next year combined with partial occlusion by means of lacquer and strips. Further treatment was resumed five years later for six months.

In June of this year the child was examined. His eyes are now parallel with and without glasses, with ease. Corrected vision is 20/20 O.U. Prism divergence is  $5^{\Delta}$ . Prism convergence is  $20^{\Delta}$ . He dispenses with his glasses at will, with comfort and increasingly clear vision.

*Case 3.* G. W., a girl aged four years had an original accommodative squint of  $30^{\Delta}$ . She was wearing a  $+3.00D.$  sph. O.U. with 20/30 vision in each eye. Treatment carried out for two years with intervening rest periods resulted in straight eyes with and without glasses.

Examination this summer, two years later, revealed eyes in excellent position, no difficulty of any kind being experienced for near or distance vision. Her correction has been reduced to  $+1.50D.$  sph. O.U. and is worn only for close work.

*Case 4.* E. A. was first seen in June, 1934. Her squint without glasses was  $24^{\Delta}$ . With an approximate correction of a  $+2.00D.$  sph. O.U. the vision of her left eye was 20/25, right eye 20/50—. She

was dismissed after 10 months of orthoptic treatment.

Nine years later her condition was checked (July, 1944). Findings were: orthophoria for distance and near with and without glasses, prism divergence  $8^{\Delta}$ , prism convergence  $23^{\Delta}$ . Her vision is 20/20 O.U. without glasses. She wears glasses only occasionally. When extremely tired she notes a little turning of her right eye.

*Case 5:* J. B. presented another accommodative case of squint and was examined six years after the completion of treatment. Her vision in 1938 was good in each eye with very small correction. Esophoria for distance measured  $11^{\Delta}$ , for near  $22^{\Delta}$ . Treatment was given for two months.

A recent examination of this child showed an esophoria of  $12^{\Delta}$  under cover for near, but she could not hold this position long. She habitually held her eyes straight.

This, however, is an example of a patient dismissed too soon. She controls the position of her eyes with ease, under normal conditions, but that control might easily become difficult under stress. In all probability, had treatment been carried out over a longer period originally, her eyes would be more permanently parallel now. This checking back has provided the opportunity to correct the earlier error and give further treatment now.

*Case 6:* H. W., aged four years, had a case of convergence excess with no refractive error. His vision was 20/20 in each eye. When first seen his eyes were parallel for distance, but the left eye turned in  $35^{\Delta}$  at near. He had double vision immediately on the inshoot of the left eye, which occurred almost constantly when an object 3 feet or nearer was fixated. There was a small vertical deviation measurable only in the upper

fields. This was not deemed sufficient to require attention.

Orthoptic treatment was given over a period of 12 months, with several two-week rest periods intervening. A smoked lens was worn over his right eye when he was doing close work. At the end of the year's work he held his eyes parallel with ease at any distance and had excellent third-grade binocular vision. Home treatment was continued for three months.

Two years have passed, and his mother reports no overconvergence at any time. Much credit goes to the patient in this case. His coöperation was almost unbelievable for his age.

*Comment.* It would seem from this review of accommodative convergent cases selected at random that patients with this anomaly can be given orthoptic treatment with some degree of assurance as to the final permanent outcome. Requisites are treatment extended over a prolonged period plus home training, with constant checking and much emphasis on the coöperation of the patient. When the refractive error is not too great and astigmatism does not play too large a part, the reduction of the correction and many times almost complete elimination of glasses can be anticipated. A wise course to follow appears evident; that is, watching and examining a dismissed patient over a period of several months following treatment.

Next there are three cases of esotropia which required surgery and orthoptic treatment. These results have all been held satisfactorily. In brief they are:

*Case 7:* L. C. G., an 11-year-old girl was first seen in 1935. She had a convergent squint of  $33^{\Delta}$  which appeared to be alternating. She was wearing O.D. a  $+3.50D.$  sph.  $\approx +1.25D.$  cyl. ax.  $70^{\circ}$ , and O.S. a  $+2.50D.$  sph.  $\approx +1.75D.$

cyl. ax.  $90^{\circ}$ . Corrected vision was 20/20 in each eye. The squint was purely mechanical. Heteronymous diplopia denoted false projection.

Two months of orthoptic treatment preceded surgery, which consisted of a resection of the right external rectus muscle and a recession of the right internal rectus. Immediately following operation her eyes were parallel for distance with  $8^{\Delta}$  of



Fig. 3 (Robinson). Case 8. Alternating convergent squint. Fig. 4, same case two years later, following surgery and orthoptic training.

exophoria present for near and a troublesome persistent diplopia. Two months' daily fusion training resulted in single binocular vision with fair fusion amplitude and stereopsis.

Her eyes were examined this summer, five years after treatment was given. They are parallel for distance with and without glasses, with  $5^{\Delta}$  of exophoria for near. Prism divergence is  $7^{\Delta}$ ; prism convergence is  $23^{\Delta}$ . She does not wear her glasses most of the time and reports comfort.

Case 8. M. T., four years old, was first seen when she had an alternating convergent squint  $50^{\Delta}$  (fig. 3).

Her vision was equal and fusion present at the true angle. After a recession of both interni her eyes were straight until eight months later, when she was frightened in a tornado. After this incident a convergent squint of  $38^{\Delta}$  appeared, first on alternate days. Orthoptic treatment given first twice a day and then once a day for a month followed by home treatment with a stereoscope resulted in consistently straight eyes.

This picture was taken in the summer of 1944, two years after treatment was given.

No return of incoördination has been noted.

Case 9. B. M., first seen seven years ago, when she was four years old, had a left esotropia of  $25^{\Delta}$ . Her vision had been made equal by occlusion. She was wearing a  $+1.50D.$  sph. in each eye. After a recession of the right internal rectus she had double vision, and exophoria measured  $12^{\Delta}$ . Daily treatment for two months eliminated double vision and developed fusion with some amplitude and stereopsis.

Examination this summer revealed excellent position of the eyes, with no report of turning since treatment had been discontinued. Vision was 20/20 in each eye. Measurements were: distance  $1^{\Delta}$  exophoria, near  $5^{\Delta}$  exophoria, prism divergence  $5^{\Delta}$ , prism convergence  $20^{\Delta}$ , immediate recognition of stereopsis.

Comment. These operative cases of esotropia are all individual problems, but a few general statements can be made. For a successful permanent result, the following steps are the ideal course to follow: the overcoming of amblyopia when present, preliminary orthoptic treatment, surgery for the elimination of the mechanical deviation, followed by further orthoptic treatment. Many complications arise and often there is no opportunity to carry out the desired course of treatment. May I make one observation here? We have not always found it possible to break down false projection and build up fusion ability at the true angle before operation, but I believe that even if this goal is not reached before surgery is carried out, the macular stimulation given in the attempt to develop fusion is of distinct advantage postoperatively, in that fusion comes about more quickly and can more easily be made permanent.

A review of 14 cases of divergence excess gives briefly the following findings:

Two nonoperative cases in patients who showed a combined divergence excess and convergence insufficiency responded well to treatment and the patients have held what they gained.

*Case 10.* B. J. C. had an original divergence excess of  $20^{\Delta}$  and a convergence

shown in figure 7, and easy convergence ability in figure 8.

The next two cases demonstrate the frequent disappointing results seen in cases of divergence excess. They are typical examples of the persistence of a very evident deviation even after the develop-



Fig. 5 (Robinson). Case 11. Divergence excess. Position of the eyes for distant vision. Fig. 6, same case. The position of the eyes when convergence was attempted.

ment of excellent binocular coordination. The gain made in each case was beyond expectations as far as vergences and voluntary control were concerned. At the end of a prolonged series of treatments the disheartening observation of a frequently wandering eye was made. On examining these patients after absences of three and four years, respectively, the same frequent outward deviation was noted, but none of the binocular skill developed had been lost. Both of these patients were very slightly hyperopic.

*Case 11.* The other divergence-excess case with combined convergence insufficiency was presented in L. J., aged 10 years. Figure 5 shows the position of her eyes on looking at distance, before treatment. Figure 6 shows an attempt to converge.

After two months of treatment and two years' absence, fixation at distance is



Fig. 7 (Robinson). Case 11. After treatment and two years' interval; fixation for distance. Fig. 8, same case, convergence ability.

ment of excellent binocular coordination. The gain made in each case was beyond expectations as far as vergences and voluntary control were concerned. At the end of a prolonged series of treatments the disheartening observation of a frequently wandering eye was made. On examining these patients after absences of three and four years, respectively, the same frequent outward deviation was noted, but none of the binocular skill developed had been lost. Both of these patients were very slightly hyperopic.

*Case 12.* B. J. B., when seen at the outset of treatment, showed a divergence as illustrated in figure 9. Figures 10 and 11 show the eyes straight, and divergent, as seen when examined four years after treatments had ceased.



Fig. 9 (Robinson). Case 12. Divergence excess. Figs. 10 and 11, same case four years later. Eyes straight and deviation; binocular skill, however, retained.

*Comment.* Four cases of divergence excess with false projection noted in the original examination are reported. In all four cases false projection was broken down and fusion amplitude developed. As each of these patients was reexamined after an absence of nine years in each case, it was noted that most of the amplitude built up remained, although each pa-

ination of false projection in these last cases prevented a possible permanent squint. The obvious conclusion is the realization that each patient is an individual to be dealt with and no two cases come under identical classifications.

The next five cases are of divergence excess in which treatment by surgical correction and orthoptic training was given.

*Case 18.* E. B. was examined nine years ago when she had an excess of  $40^{\Delta}$  and equal vision. Her refractive error was  $-1.00D.$  sph., O.U. Fusion and convergence training was given for five months. A recession of the right externus was then performed, leaving  $20^{\Delta}$  of exophoria to be taken care of by orthoptic treatment, which was administered for four months.

In 1944, five years later, her eyes were found to be habitually in excellent position. She has a demonstrable exophoria to  $15^{\Delta}$  for distance and  $4^{\Delta}$  for near. This deviation, however, is entirely held in check by a still present prism convergence of  $60^{\Delta}$ . No discomfort nor inconvenience is experienced now.

*Case 19.* A. M. had a divergence excess of  $22^{\Delta}$  in 1938. A tenotomy of the right external rectus had been done eight years before. A good result was achieved by two months' treatment.

Reexamination this summer, six years after treatment was given, shows fusion amplitude still good, the patient comfortable, and the eyes parallel most of the time. The following pictures (figs. 13, 14) show her before treatment and at the present time.

*Case 20.* E. D. had an alternating divergence excess of  $29^{\Delta}$  in 1937. True fusion ability was present but was held only momentarily. A correction of a  $-3.00D.$  sph., O.U. was worn. Both externi were recessed, leaving an exophoria of  $11^{\Delta}$ . This patient lived out of town and was given fusion training at home with a



Fig. 12 (Robinson). Case 14. Divergence excess before treatment. Fig. 13, same case six years after surgery and orthoptic treatment.

tient reported that under stress occasional divergence was noted.

An interesting observation is that in none of these cases was there any trace of reversion to false fixation. True projection was present in every instance, giving emphasis to the belief that even though the tendency to diverge was not eliminated by orthoptic training, the ability to overcome it was of sufficient strength and permanence to prevent anything but momentary loss under stress of binocular vision.

I believe it is the consensus of opinion that both time and effort are put to little use in attempting to develop binocular coordination by orthoptic treatment alone in patients with a divergence excess. This belief is borne out in many instances and has been demonstrated by two previous cases reported here. However, the degree of improvement held in these last four cases I believe gives justification to the expenditure of a fair amount of work and time in at least selected cases. It is true that perhaps surgery and orthoptic treatment combined would have been more advisable, but much was gained and held by orthoptic training alone. The fact that we can never know what we prevent leaves us with an uncertain argument, but it seems plausible to suggest that the elim-

stereoscope and suitable cards, with return visits for supervision of training. This was kept up for 14 months after operation. Examination six years after treatment was stopped showed an exophoria of 4<sup>A</sup> for distance and 5<sup>A</sup> for near.

Case 21. E. S. had an alternating divergence excess of 60<sup>A</sup> in 1941. Both external recti muscles were recessed, leaving 35<sup>A</sup> of divergence excess. Treatment was given for two months. The patient was dismissed with eyes in good position and excellent fusion amplitude. She was checked two years later: the eyes are parallel most of the time, but the divergence tendency is not always held in check when the patient is tired or ill.

Case 22. B. M. had an original divergence excess of 29<sup>A</sup> and amblyopia of the left eye with vision 20/70. He was wearing a +.50D. sph.  $\approx$  +.50D. cyl. ax. 90°, O.U. Occlusion for one year resulted in equal vision in both eyes. Surgery brought about an overcorrection of 8<sup>A</sup>, with a troublesome diplopia. Orthoptic treatment was given for four months, at the end of which time the patient was dismissed to continue home training with a stereoscope and base-in cards.

Four years later he had orthophoria for distance and near, with 5<sup>A</sup> of prism divergence and 17<sup>A</sup> of prism convergence. His vision is 20/20 in both eyes, and he is comfortable.

*Comment.* The amount of improvement held in these operative divergence-excess cases varies, but the percentage of gain that remains is high. Indications in some instances are of a longer training period, in others of a more complete surgical correction. But outstanding still is the factor of individual effort and response.

In this last group, consisting of 28 insufficiency cases, the most interesting reply to the inquiries made came from the South Pacific from a former medical

student who needed better binocular coordination to enable him to study more comfortably. In his own words he can see the bombs falling easily but with some discomfort!

Of these 28 insufficiency cases, I was able to secure information concerning only one patient, whose difficulty had been divergence insufficiency. In the treatment of this condition of very uncertain prognosis I believe determined effort had much to do with the improvement recorded and held in this instance. This person was in the ministry but had a great desire to go into teaching and research work. He hesitated to make the change because of the discomfort caused by close work. His measurements were an esophoria of 15<sup>A</sup> for distance, and 10<sup>A</sup> for near. He had no refractive error. His vision was 20/20, O.U. A sense of fusion and stereopsis was present.

The home use of base-in cards with a stereoscope together with scattered office treatments during the next seven months resulted in almost complete comfort in the use of his eyes and enabled him to accept the position offered. His esophoria at that time measured 5<sup>A</sup> for distance and near; prism divergence 7<sup>A</sup>, prism convergence 45<sup>A</sup>. He left the city and was not heard from until he answered my letter this summer, having left equipped with a stereoscope and suitable cards to be used as he felt the need.

His reply, recently received, follows in part: "It has been more than a year since I have done any of my eye exercises. During the past 10 months I have spent most of my time reading and have experienced very little inconvenience. I am writing this after 8 hours of comfortable reading."

This, again, is an example of the individuality of response to treatment. I would hesitate to make an overall statement concerning permanent or temporary



response of patients with divergence insufficiency. This encouraging instance, however, shows what is possible even if in isolated cases.

With regard to the most easily treated and most rapidly relieved group of patients—the convergence-insufficiency group—I should like to make a few preliminary observations. First, *concerning the need for treatment*: There are many persons, particularly adults, who are handicapped in their daily occupations because of a lack of comfortable binocular coordination, especially for near vision. When correction of this condition is not made, these persons become dissatisfied patients who constantly seek relief by means of a change in their refractive correction. Their discomfort is many times dismissed lightly; but a medical student who cannot study with comfort or a draftsman who cannot execute his work accurately or a banker who sees his clients double across his desk or even a homemaker who cannot sew with ease should not be ignored. This group must be dealt with regardless of the time consumed. I believe it is of the utmost importance to rehabilitate these uncomfortable patients.

*Concerning symptoms and measurements*: These vary greatly and are often contradictory. One person may be just as uncomfortable with a convergence near point of 3 cm. as the next one is with a convergence near point of 15 cm. The most reliable indication as to the need for convergence training is, in our experience, the taking of vergences at near during reading. This is commonly called the *reading ratio*. I mention this because this ratio was the one finding in all of these 26 rechecked cases that was constant in showing the cause for the original discomfort.

With regard to *permanence of progress made*: We have found in this group a

consistent report of subjective improvement held and findings of from 90 to 100 percent of improvement made still present according to objective measurements after from two to eight years' absence. Two of these cases were in children whose poor reading habit was traced directly to poor convergence ability. The most definite promise of permanent improvement and relief from symptoms can be made in cases of convergence insufficiency.

### CONCLUSIONS

A few facts may be mentioned concerning what can be generally anticipated with regard to permanent results obtained by means of orthoptic treatment.

First, that the potential response of each patient is a deciding factor to be considered. Treatment of necessity must be given in the light of former experience but always with the awareness of the individuality of the patient.

Second, that orthoptic treatment is a necessary adjunct to the treatment of squint, but failure to realize its limitations will lead to disappointing results. It cannot replace other necessary measures, but neither can its place be taken by any other procedure. The use of orthoptic treatment is essential to a functional permanent result, and with constant striving that use may extend beyond present realizations.

Third, that by means of orthoptic treatment the tendency of an eye to deviate is often not eliminated, but the ability to overcome this tendency is strengthened so that the deviation is not troublesome.

Finally, that the obtaining of a good permanent result does not depend upon the degree of squint nor the amount of amblyopia present, but rather upon the correct diagnosis of the condition and the treating of this condition by various methods put to use in logical sequence.

*Exchange Building.*

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## DISCUSSION

DR. E. C. ELLETT (Memphis): Miss Robinson's interesting contribution reminds us all how important the matter of records is, for by records alone can we follow such work as this, study the progress or lack of it that attends our efforts, and not only profit by it our-

selves, but pass it on in such a convincing shape that others will accept it as correct. The excellent photographs which lend so much to the report are a most valuable and convincing part of the records, and I know it to be true that these too are Miss Robinson's own work.

## PENICILLIN TREATMENT OF TRACHOMA

## A PRELIMINARY REPORT

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In June, 1944, when penicillin was first made available to the United States Indian Service hospitals, its use in the treatment of trachoma was initiated at the Cass Lake, Minnesota, Indian Hospital. As sulfanilamide, in the past, has been used extensively and with specific success in the treatment of the disease in this locality, some difficulty was experienced in finding a sufficient number of typical and unquestionably active cases of trachoma for trial with penicillin.

To date, 12 cases, ranging from the typical textbook type I to the chronic type III, have been treated. Since no other reports of treatment of definite unquestionable cases with penicillin have appeared and since results in this series have been so encouraging, it is believed that a preliminary report is indicated, even though only a short time has elapsed since these cases have undergone treatment.

To be classified as typical active trachoma, in the acute stage, a case should exhibit the following symptoms in varying degree: lacrimation, photophobia, diminished vision, and a granular sensation, subjectively; objectively, hyperemia, swelling, subepithelial follicles or granulations of the palpebral conjunctiva. In the more chronic affections, there should be a thickened, hyperemic, velvety, palpebral conjunctiva extending to the retro-tarsal folds, or a thickened and scarred palpebral conjunctiva with scattered islands of hyperemic granulation tissue. The palpebral conjunctival vessels should usually be invisible. In all cases of active trachoma, either acute or chronic, pannus must be present. Pannus may be either grossly evident or may require the aid of the slitlamp to be seen.

Only cases exhibiting most of the aforementioned typical findings of trachoma were used in the series. Pannus of vary-

ing degree was present in all 12 instances.

As at the time of the initiation of the investigation there was no precedent to follow, it was decided, as a trial, to employ topically the sodium salt of penicillin in a solution of 500 units to each cubic centimeter of water rather than to administer the drug parenterally. Thus, a high concentration was obtained where most needed. Since then it has been reported that topical application is the preferable method of administration in ocular diseases affecting the anterior surface of the globe and the conjunctiva of the lids.<sup>1</sup>

At the onset, only a three-day supply of the solution was prepared each time, and this was kept under refrigeration. Drops of this solution were instilled by the nurse every three hours during the day. Later, when it was reported that penicillin solutions retained their potency for approximately a week at room temperature,<sup>2</sup> the policy of leaving a one- or two-day supply at the patient's bedside was adopted, the patient being instructed to instil two drops in each eye every half hour when awake. In addition, the instillation of drops every three hours was continued, thus making certain that, in case the patient was negligent, some treatment was being received. Under the original three-hour schedule, improvement in all cases was observed, but this improvement was more rapid under the half-hour schedule.

In this series, as with sulfanilamide, loss of photophobia and lacrimation was the first change observed, this improvement being noticed following 24 to 48 hours of treatment. Improvement in vision was usually evident on the third day, as was paling and thinning of the hyperemic palpebral conjunctiva, with gradual flattening of follicles and granulation tissue. Beginning shrinking and retraction of vessels of the pannus was definite on the fifth to the seventh day, with

accompanying slower clearing of the gray corneal pannus infiltrate. Rapid healing of complicating corneal erosions and ulcers was the most spectacular improvement observed.

The average period of hospitalization, in the series, was 19 days. As most of the cases came from isolated and distant regions to the Hospital, postdischarge follow-up was difficult. Six of the patients were seen approximately six weeks and again five months following cessation of treatment. Improvement beyond that present on discharge was evident in all.

Although a series of 12 cases, only 6 of which were observed following discontinuance of therapy, is inconclusive evidence that penicillin is a specific in the treatment of trachoma, it is felt that the marked improvement noted in each instance is sufficient to encourage further work with the drug by those treating trachoma. The improvement observed is in no way superior nor more rapid than that obtained by the well-established sulfanilamide therapy introduced by Loe of the Indian Service,<sup>3</sup> except that penicillin may offer a solution in the treatment of sulfanilamide-resistant or sensitive cases.

The following two cases are illustrative of the response to penicillin therapy.

#### REPORT OF CASES

*Case 1.* D. F., an eight-year-old Indian boy with an essentially negative past history was admitted to the Hospital on August 25, 1944, for treatment of "sore eyes." Physical examination on admission was essentially negative with the exception of the eyes. These presented a typical type I trachoma, evidenced by marked reddening and thickening of the palpebral conjunctiva, with the presence of many typical follicles on both lids, mainly the upper. A moderate well-vascularized pannus was present on both corneas. Photophobia and lacrimation with morning crusting of the edges of the lids were

marked. Instillation of drops of penicillin sodium, 1:500 solution, was initiated on the day of admission. On August 31st, marked paling of the palpebral conjunctiva and decrease of follicles were evident. Photophobia, lacrimation, and crusting were absent. On September 8th, the follicles had decreased markedly and were paler than the rest of the mucosa. The previously red and velvety conjunctiva was pale; its vessels, previously invisible, were now clearly seen. On September 27th, the date of discharge, the conjunctiva of the lids was pale, no thickness nor follicles were present, and the conjunctival vessels were clearly visible. The previously well-vascularized pannus was devoid of vessels and had retracted to near the limbus. The vision, which had been 20/80 on admission, was 20/30 on the date of discharge. On January 15, 1945, the vision was 20/20 and no evidence of activity was present.

Case 2. J. R., a 67-year-old, well-nourished, healthy-appearing, full-blooded illiterate Indian male, who had had no past illnesses of note, was admitted to the Hospital on August 25, 1944, for treatment of trachoma, which had been present since he was a young man. Past treatment had consisted of irregular use of copper sulphate and grattage 15 years previously. There had been no sulfanilamide therapy. His brother, sister, and two nephews, examined one month previously, all had active trachoma. Examination of the eyes disclosed narrowing of—both palpebral fissures, moderate photophobia, crusting of the edges of the lids, and many islands of velvety-red granulations on the conjunctiva of both upper and

lower lids. Marked pannus was present on both corneas, with vascularization extending to the extreme edge of the pannus. He was unable to look out of the Hospital window without marked squinting and was unable to count the number of fingers held 60 inches before him. Treatment by instillation of drops of 1:500 solution of penicillin sodium every half hour was initiated on the date of admission. Three days later lacrimation and photophobia were absent, the islands of granulation tissue were much paler, and he was able to count the number of fingers held 60 inches before him. On September 6th, 12 days after the onset of treatment, the islands of granulation tissue were gone, and the palpebral conjunctival vessels were evident. The previously marked pannus vascularization had almost completely disappeared. The gray pannus infiltrate had become more transparent and had retracted considerably. On September 8th, the penicillin drops were discontinued because of the onset of an acute hyperemia of the scleras. This was thought to be due to the penicillin, as the injection disappeared following cessation of the penicillin instillations. At the time of his discharge from the Hospital, on September 18th, the mucosa of the lids was pale and devoid of granulation; the individual vessels were visible. There was no photophobia, lacrimation, nor crusting. The pannus had receded to three fourths its original size, had become less dense, and was devoid of vessels. The patient stated that he could see better than he had been able to since youth. The improvement was still present five months later.

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# NOTES, CASES, INSTRUMENTS

## BOECK'S SARCOID WITH UVEOPAROTITIS AND DACRYOADENITIS\*

### REPORT OF A CASE

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Following the adoption of the misnomer "saroid" by Caesar Boeck,<sup>1</sup> in 1899, for skin lesions which resemble sarcoma, this disease, under various titles, has stimulated much interest in practically all the fields of medicine. The first modern concept of this widespread systemic disorder was defined by Schaumann<sup>2</sup> in 1916, who recognized it as a chronic, relatively benign granuloma which may involve any organ or tissue, with special predilection for the reticuloendothelial system. This concept has been further developed, especially in recent years, by many authors, including Reisner,<sup>3</sup> Harrell,<sup>4</sup> and Woods and Guyton.<sup>5</sup>

Sarcoidosis occurs most frequently between the ages of 20 and 30 years, and is preponderant in Negroes. Its prognosis is generally favorable, spontaneous resolution of the lesions frequently occurring during its protractive course. Lymphadenopathy, either general or local, is almost constantly present at some stage of this disease. The lungs are affected almost as frequently, though the physical findings are often sparse. Roentgen examination usually reveals diffuse reticular infiltration which extends toward the bases, associated with hilar enlargement. Cutaneous lesions are present in 50 percent of the cases and appear as firm swellings of the superficial (Boeck) or

deep (Darier-Roussy) type. Characteristic cystlike changes in the small bones of the hands or feet occur in about 15 percent of these cases.

The characteristic lesion in Boeck's saroid is the "hard" tubercle, which is composed of an accumulation of epithelioid cells interspersed with some giant cells of the Langhans type and surrounded by sparsely scattered lymphocytes. Central necrosis and caseation is usually absent, and healing occurs by fibrosis.

The cause of sarcoidosis is yet unknown. No virus nor bacteria have thus far been isolated. The treatment is symptomatic, aided by general supportive measures.

### OCULAR INVOLVEMENT

The eye and its adnexa are frequently involved in sarcoidosis. The ocular symptoms, in fact, may be the first to manifest themselves in this disease. Any of the ocular structures may be involved, including the lids, conjunctiva, lacrimal glands, cornea, sclera, orbit, and fundus. The most common ocular lesion, however, is infection of the uveal tract. Schumacher,<sup>6</sup> in 1909, was the first to describe iritis in Boeck's saroid. Since then, uveitis in sarcoidosis has frequently been reported and its incidence has varied from 5 percent (Osterberg<sup>7</sup>) to 28 percent (Levitt<sup>8</sup>). Woods and Guyton<sup>5</sup> estimated that 2 to 3 percent of all cases of chronic uveitis may be due to sarcoidosis.

Uveitis may occur at any stage of sarcoidosis and is usually bilateral. It resembles tuberculous iritis clinically, although its course tends to be milder. The uveitis may assume the benign chronic, serous form, or the more extensive nodular type. Unlike tuberculous nodules of the iris, these tend to resolve without leav-

\* From the Eye Section, Lovell General and Convalescent Hospital.

ing appreciable scars. Though the uveitis tends to heal spontaneously, ocular sequelae in the form of keratitis, secondary glaucoma, and phthisis bulbi are not infrequent.

The association of chronic uveitis with parotid swelling, a syndrome first described by Heerfordt<sup>9</sup> as uveoparotitis, has been recognized by recent investigators, including Longcope and Pierson,<sup>10</sup> Scott,<sup>11</sup> and Walsh,<sup>12</sup> as a phase of sarcoidosis. Mikulicz's syndrome, characterized by enlargement of the lacrimal and salivary glands, has also been considered by some writers, including Hamburger and Schaeffer,<sup>13</sup> as a manifestation of sarcoid. This conclusion is confirmed by King<sup>14</sup> after histologic study of parotid glands removed from three patients with Mikulicz's syndrome. Further study will, no doubt, support this trend to regard both Heerfordt's and Mikulicz's syndromes as variable manifestations of sarcoidosis.

This case of Boeck's sarcoid is reported because of the unusual association of uveoparotitis and dacryoadenitis. It also offers further evidence that Heerfordt's disease and Mikulicz's syndrome, which had often been regarded as separate clinical entities, are both manifestations of sarcoidosis.

#### REPORT OF A CASE

A colored soldier, aged 24 years, was apparently well until April, 1944, when he began to notice occasional pain in the left side of the chest, associated with cough and increased fatigue upon exertion. These symptoms, together with a gradual loss of weight, became progressively worse and necessitated his admission into a station hospital on June 13, 1944. Four days after his hospitalization, he began to develop swelling and tenderness of both parotid glands as well as of the lacrimal glands. Redness of both eyes be-

came apparent a week later and was associated with an appreciable diminution of vision. Studies failed to reveal any evidence of pulmonary tuberculosis. He was transferred to this general hospital on July 6, 1944, for further observation and treatment.

His father died of pulmonary tuberculosis at the age of 39 years. The mother died at the age of 29 years from a cause unknown. One brother is living and well. The patient had worked on a farm in Arkansas till he was inducted into the Army in December, 1942. He has been married four years and has two children living and well. Except for the usual exanthematous diseases and pneumonia at the age of 16 years, he had previously enjoyed relatively good health.

*Physical examination* revealed a moderately debilitated and malnourished colored soldier weighing 140 pounds, who was mildly febrile. Both lacrimal glands were tender and symmetrically enlarged to the size of a small walnut (figs. 1a and 1b). The parotid glands were firm and slightly swollen, though painless. Discrete, insensitive lymph glands, the size of a pea, could be palpated in the posterior cervical, supraclavicular and inguinal regions. The chest was clear except for some moist rales at the base of the left base. Neurologic examination revealed no abnormalities. No cutaneous lesions were observed. The liver and spleen were not palpable.

*Ocular examination.* Vision in the right eye was reduced to 20/200; in the left eye it was 20/400. The lacrimal glands were enlarged as previously described. A mild mixed injection of the bulbar conjunctiva was present bilaterally. Tension (McLean) was 20 and 22 mm. Hg in the right and left eye, respectively.

Biomicroscopy revealed evidence of severe iridocyclitis in both eyes, more marked in the left. Numerous keratic precipitates, consisting of fine, gray ex-

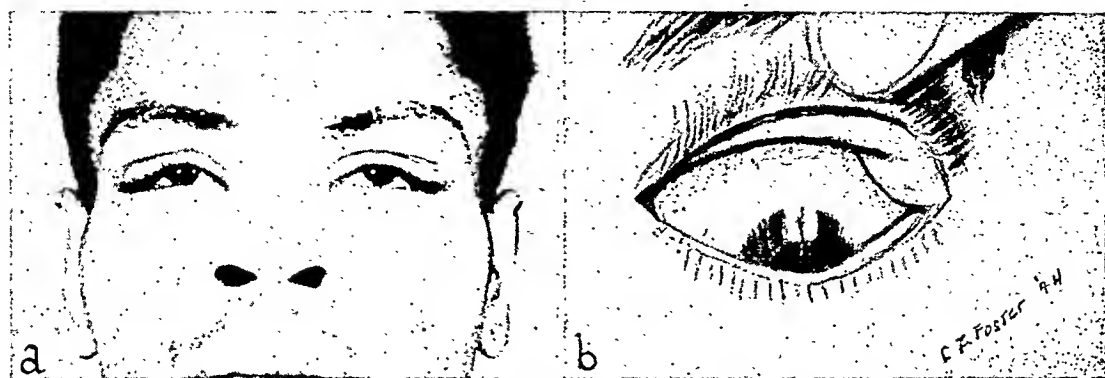


Fig. 1 (Schultz). Boeck's sarcoid. a, Showing enlargement of both lacrimal glands. b, Appearance of the enlarged lacrimal gland of the left eye after the upper lid was everted.

updates and larger mutton-fat deposits were observed on the posterior surface of each cornea. Iris pigment was profusely scattered over the anterior capsule of each lens, especially about the borders of the dilated pupils. The aqueous humor as well as the vitreous of each eye contained many fine cells and appeared turbid. Both fundi appeared normal except for hyperemia of the discs.

*Roentgenographic observation.* Roent-

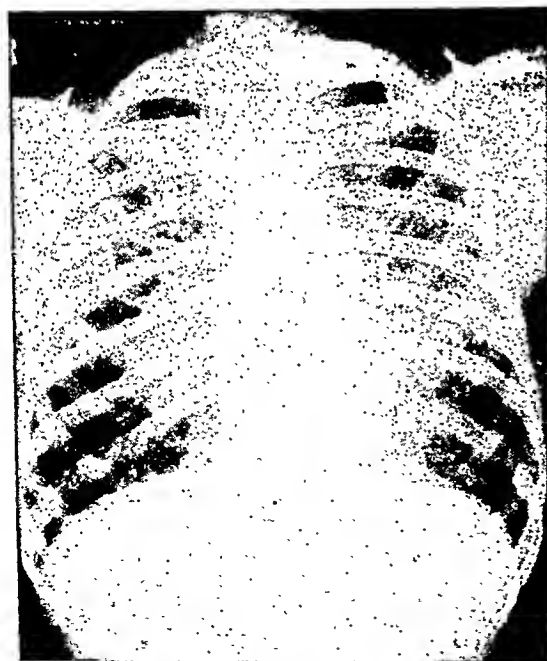


Fig. 2 (Schultz). Roentgenogram of the chest, showing enlarged hilar shadows and radicular infiltrations throughout both lungs.

gen examination of the chest revealed diffuse radicular infiltrations throughout both lungs, more marked in the left (fig. 2). The apices were not involved. Bilateral enlargement of the paratracheal and hilar lymph nodes was also present. A roentgenogram of the hands (fig. 3) revealed cystlike areas in the heads of the left second, third, and fourth metacarpals.

*Laboratory studies.* The blood showed a mild anemia with normal hemoglobin content. The white cell count varied from 5,450 to 9,200 per cubic millimeter, lymphocytes averaging 41 percent, and monocytes 5 percent. Repeated examination of

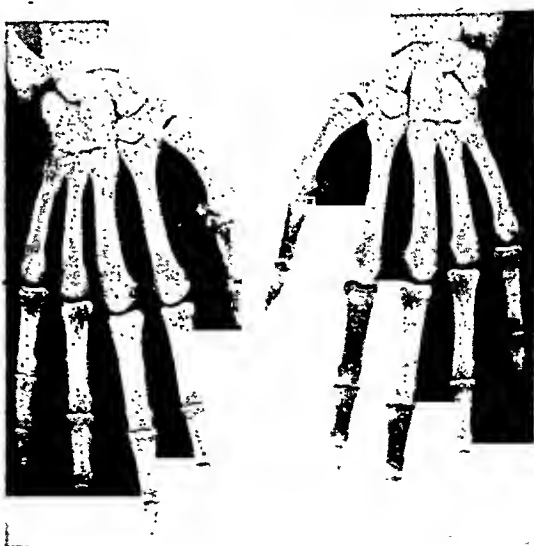


Fig. 3 (Schultz). Roentgenogram of the hands showing areas of rarefaction in the heads of the left second, third, and fourth metacarpals.

the sputum revealed no acid-fast bacilli. The Mantoux reaction was negative with 0.1 mg. of old tuberculin. The sedimentation rate varied from 60 to 78 mm. per hour. The serologic reactions of the blood were negative. Urinalysis revealed occasional white blood cells and hyaline casts. The serum protein was 6.5 gm. per hundred cubic centimeters with 2.8 gm. of albumin and 3.7 gm. of globulin (albumin-globulin ratio 0.80). Chemical examination of the blood for phosphorus, phosphatase, and calcium was 4.3 mg., 5.6 units, and 11.4 mg., respectively, per hundred centimeters.

*Pathologic examination* (Capt. George J. Heid). Biopsy specimen from a portion of the left lacrimal gland revealed that much of the glandular tissue was replaced by well-preserved, noncaseating tubercles which were formed by loosely arranged, large epithelioid cells. Most of the tubercles were well demarcated by a very thin fibrous capsule or compressed lacrimal stroma and acini. A few multinucleated giant cells were present in the section. The diagnosis was Boeck's sarcoid. A biopsy specimen from a posterior cervical gland (fig. 4), which was subsequently excised, gave a similar microscopic appearance, though there was evidence of slight necrosis in the central portion of some tubercles.

*Course in the hospital.* The patient's general condition gradually improved sufficiently with supportive treatment to enable him to become ambulatory. His low-grade fever then completely abated. The chest symptoms were relieved by anti-asthmatic therapy. During the first four months of hospitalization, his weight continued to decline from a previous normal 175 pounds to 131 pounds, despite a high caloric diet supplemented by vitamins. A slow improvement in weight, however, was noted after that period. The enlarged parotid glands returned to nor-

mal in three weeks. The swollen lacrimal glands, however, did not completely subside during his five months of hospitalization. His sedimentation rate continued to remain high. The bilateral uveitis remained essentially unchanged, with no improvement of vision. In the fourth month of ocular involvement, superficial punctate keratitis and subepithelial infiltration began to appear in the inferior portions of both corneas, more marked in the left. These changes were associated with su-

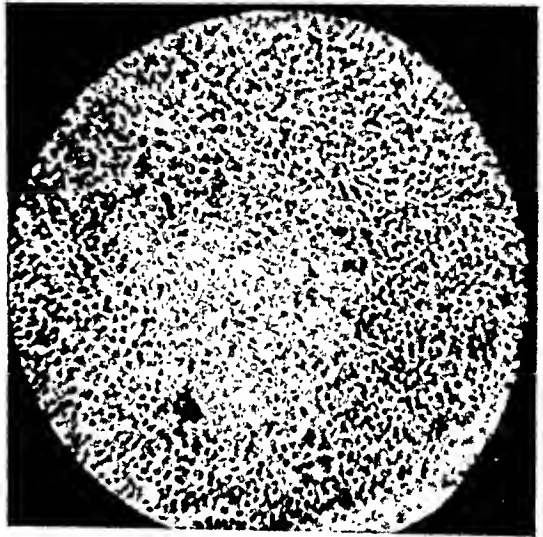


Fig. 4 (Schultz). Photomicrograph (high power) of a section of cervical lymph gland, showing typical "hard" tubercle of Boeck's sarcoid.

perficial scarring of the involved areas. Because of the persistence of ocular activity and generalized weakness, he was transferred to a Veterans' Hospital, November 8, 1944, for further medical care.

#### SUMMARY AND CONCLUSION

A case of Boeck's sarcoid is reported associated with uveoparotitis and dacryoadenitis. Characteristic involvement of the lungs, lymph glands, and bones is described. The Mantoux reaction was negative in strong dilutions. The serum globulin was increased. Final diagnosis was based upon biopsy specimens taken



from the lacrimal and cervical glands, revealing the typical "hard" tubercle. The general condition of this patient improved with subsidence of the swelling of the lacrimal and parotid glands. The severe uveitis, however, persisted, and a superficial keratitis subsequently manifested itself in each eye.

Chronic uveitis is the most frequent ocular lesion of sarcoidosis and occurs in about 10 percent of these cases.

Boeck's sarcoid should be suspected in all chronic infections of the uveal tract that have usually been considered tuber-

culous.

This case also tends to corroborate mounting evidence that uveoparotitis (Heerfordt's disease) and Mikulicz's syndrome are frequently manifestations of Boeck's sarcoid.

NOTE: Since this paper was submitted for publication, another case of Boeck's sarcoid with marked enlargement of the lacrimal and parotid glands has been observed by the writer in a colored soldier. There was no involvement of the uveal tract. Study of a biopsy specimen of the lacrimal gland confirmed the diagnosis.

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#### SEVERE LACERATION OF ONLY EYE WITH RECOVERY OF USEFUL SIGHT

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The following history illustrates the fact that every effort should be made to

try to save what appears to be a completely destroyed eye, particularly when it is the only one.

On the morning of April 12, 1944, a badly shocked and blinded man, aged 52 years, was led into my office by fellow workers.

While leaning from a slippery bank to

open an auto truck door, he had lost his footing and fallen against the upper corner of the open door, striking his right eye, and causing immediate total blindness. The other eye had been enucleated 40 years before, following a gunshot accident.

The patient was immediately examined, and the eyeball was found to be ruptured over the ciliary region. The laceration extended from the 7-o'clock to 12-o'clock position. A large blood clot was removed from the laceration, which contained a considerable portion of prolapsed and lacerated iris as well. The entire globe was collapsed and seemed to contain nothing but clotted blood. In spite of the apparent hopelessness of the situation, the eye was cocaineized by applying cocaine flakes at 5-minute intervals for four applications. A careful cleansing of the eye and excision of the prolapsed iris made it possible to obtain an accurate outline of the wound. I was able to place three corneoscleral sutures located at the 9-, 10-, and 11-o'clock positions. A 2-percent atropine ointment together with sulfathiazole ointment was instilled. The patient was transported to the Fitkin Hospital by ambulance where tetanus antitoxin and a hypodermic injection of sodium sulfadiazine were given. After the initial dose of sodium sulfadiazine, the patient was given 5 gm. of sulfadiazine four hours later, by mouth, and 2 gm. every four hours thereafter until April 20th (eight days later), when the dose was gradually diminished. Sulfadiazine therapy was discontinued on May 6th.

Routine check of the Wassermann reaction was found to be 4 plus. The only anti-luetic treatment given while the patient was in the Hospital was the use of potassium iodide solution by mouth. He remained in the Hospital until May 20th, at which time he could distinguish hand motion to the temporal side. Absorption

of vitreous hemorrhage was gradual, and by July 6th, or nearly three months after the accident, it could be definitely established that the lens had been extruded at the time of the accident. On August 3d, the fundus could be fairly well visualized and showed no severe lesions. The patient was refracted and given the following correction: O.D. +11.00D. sph.  $\approx$  +4.50D. cyl. ax. 130° with which he had 20/50 vision.

The case cited above I believe to be unusual and the satisfaction in watching the slow improvement in the eye, together with the improvement in the morale of the patient, was a great source of satisfaction to me.

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## A NEW TYPE OF ENUCLEATION IMPLANT

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The large percentage of globes extruded after implantation following enucleation or evisceration has led to a constant search for new types of implants. Vitallium spheres, perhaps the latest type, are not in my experience retained in a larger proportion of cases than are the other types.

It occurred to me that an implant in the form of a skeleton or open framework, instead of a continuous surface, might be more successfully retained. A blood clot would form inside of the open framework and become organized into fibrous tissue running in all directions. This would fasten the implant in place. The Guist sphere, which is made from porous animal bone, is based on this concept. It also occurred to me that the new plastic material, acrylic resin or methyl and ethyl methacrylate, which is used so much in dentistry, would be an inex-

pensive, easily worked and readily available substance for making the implant. Berens and Rothbard\* have recommended similar materials (Lucite and

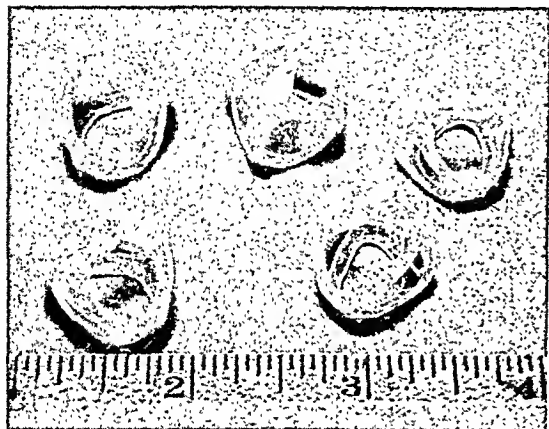


Fig. 1 (Eggers). Photograph of fenestrated plastic implant.

Plexiglass) and have stressed the fact that they are nonirritating and non-absorbable.

The acrylic skeleton implant is very

light in weight, colorless and translucent in appearance. It weighs slightly less than a continuous glass implant of the same diameter, and less than half as much as a continuous-surface vitallium implant. The framework, which is approximately one-eighth inch in width, separates six large equal-sized openings. It might be better to have only four openings—all equal in size and elliptical in shape, and all running in the same direction from pole to pole. These would furnish grooves for the four recti muscles. The spherical shape need not be used. Berens and Rothbard recommended a quadrilateral and pyramidal form, rounded at one extremity and tapered to a blunt point at the other. Any dental laboratory technician can easily make the implant by following the appended directions.† Sterilization can be accomplished by boiling, autoclaving, or placing the implant in one of the usual sterilizing solutions.

\* Berens, C., and Rothbard, S. Synthetic plastic material for implantation into orbit following enucleation. *Amer. Jour. Ophth.*, 1941, v. 24, May, p. 550.

† The following directions should enable any dental laboratory technician to make the implants: A marble (a child's play marble) of the proper size (14 to 18 mm. in diameter) is used because of its spherical contour and ready availability.

Cover the marble lightly with glycerin or oil, and adapt plate wax over its surface. Cut through the wax around the equator of the sphere, and remove the two hollow wax hemispheres from the underlying marble.

Insert an ordinary flat headed screw, about three quarters of an inch in length, through the pole of one of the wax hemispheres so that about two thirds of the length of the screw will protrude into the cavity of the hemisphere.

Mix dental stone and pour it into each of the wax hemispheres so as completely to fill the hemispheres. Press the two filled hemispheres together and allow the stone to harden. Then remove the wax, leaving a stone sphere with a screw projecting into it for about two thirds of its length.

Adapt tin foil around the stone sphere. A piece about two inches square will suffice. Cut plate wax into strips about one-eighth inch wide. Wind the strips around the sphere so as to produce the desired pattern for the framework of the final implant, no wax, of course, being placed where the openings are to be located.

The stone sphere with its windings of wax strips is invested in plaster in the lower half of a flask. Half of the sphere—the half containing the screw—is buried in the plaster. The plaster is allowed to set. Then the usual separating medium is applied to the surface of the plaster in the lower half of the flask. Plaster is poured into the upper half of the flask and the latter is closed. The plaster again is allowed to set. Then the wax is softened by placing the flask in boiling water for at least 10 minutes. The flask is opened and the wax is removed by thorough rinsing with chloroform and with clean boiling water.

The plastic material is mixed as directed by the manufacturer. It is packed into the spaces formerly occupied by the wax. Curing is done in the usual manner. The screw is pulled out. Stone and foil are dug out through the various openings. Finally, the edges of the plastic implant are trimmed and polished.

Preliminary experience with this new implant has been very favorable. It has not been used sufficiently long, nor in a sufficient number of cases to justify unequivocal recommendation.

*Oakland Regional Hospital (14).*

## NEW TECHNIQUE IN ORBIT RE-CONSTRUCTION FOLLOWING RADICAL SURGERY

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A.U.S.

A veteran of World War I, aged 54 years, gave a history of having had a pterygium removed from his left eye in 1939. Since that time it had recurred and in the past year had completely obstructed his vision. He was sent to the Brooke General Hospital, Fort Sam Houston, Texas, for diagnosis and treatment.

**EXAMINATION.** The results of his physical examination, including dental, urologic, ear, nose, and throat consultations, were normal. Blood pressure was 160/90. The only pathologic change or trouble was to be found in the left eye.

**Ophthalmologic examination.** Vision O.D. was 20/40, correctable to 20/15; O.S. light perception only. Externally the right eye was normal. The cornea of the left eye was covered with thickened, rough epithelium everywhere except at the 6-o'clock position, where there was an area about 3 mm. in diameter of clear cornea. The iris dilated evenly, and reacted to light.

**Slitlamp examination** revealed normal external structures in the right eye. In the left eye the cornea was covered with epithelium, well vascularized but not inflamed; instead it was somewhat pale. It was rough and irregular and thickened at the limbus nasally and above. That part of the anterior chamber in view below was optically clear.

The *ophthalmoscopic* examination showed a normal right eye. In the left eye, the part of the fundus that could be viewed from below was normal.

**Course.** A biopsy specimen was taken on August 11, 1944, and reported on August 16th as follows: Squamous-cell type, epidermoid carcinoma. During the interval between taking the specimen and receiving the report X-ray therapy was

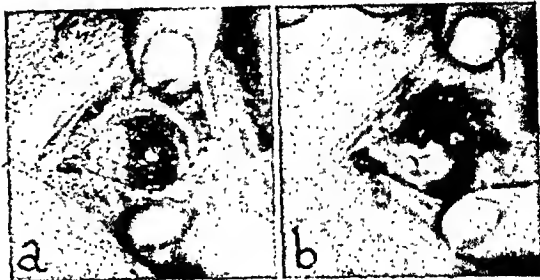


Fig. 1 (McKay). a. Fifth postoperative day. Graft viewed through the glass sphere. b. Fifth postoperative day. Graft in place.

given to a total of 5,000 r over five daily exposures.

**Operation.** On August 19th an enucleation of the left eye was performed, which included all the bulbar conjunctiva and that of the cul-de-sac up to the lid conjunctiva. The plastic surgeon, Major Laurence Quill (MC), cut a split-thickness graft from the thigh. At his suggestion I used thrombin and heparinized serum as a glue.\* The field was dried completely with hot, wet compresses, then the muscles were tied. This as the bed was painted with the heparinized serum, and the graft was placed over a 24-mm. glass sphere, painted with the thrombin, the glass sphere reversed, and placed in

\* Five minims of heparin are mixed with 5 c.c. of the patient's whole blood and centrifuged 10 minutes. The serum is taken off and this heparinized serum is applied to the operative surface. Five thousand units of thrombin, topical, are diluted with 5 c.c. of isotonic saline and applied to the graft (Tidrick, R. T., and Warner, E. D. Fibrin, fixation of skin transplants. *Surgery*, v. 15, p. 90).

the socket. On the third postoperative day the dressing was removed and the graft could be viewed through the glass sphere; it was in good condition. The patient made an uneventful, comfortable, and prompt recovery. He was discharged from the Hospital, wearing an artificial eye.

## OPHTHALMOLOGY IN VENEZUELA

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The earliest references to the practice of ophthalmology in Venezuela date from the year 1793. Cataractous eyes were operated on by the two methods of couching and extraction, and the official fee set for these procedures by the Colony was 25 pesos, or \$20.00 in United States currency, for couching, and 50 pesos, or \$40.00, for extraction.

The first teacher of ophthalmology in Venezuela was Dr. Jose Maria Vargas, who, in 1827, after the Independence Wars, was the founder of the first medical school. In addition to other medical subjects he taught ophthalmology, and among his works was a "Treatise on diseases of the eyes." At this time ophthalmology was more advanced than were the other surgical specialties because many general surgeons and internists practiced some form of the art.

In the latter half of the nineteenth century there appeared many noted ophthalmologists, and many written works on the subject. The most important of these were the contributions by Dr. Eliseo Acosta on "Oral lessons on diseases of the eye" and Gibernau y Subira on "Anatomy and diseases of the eyes."

In 1891, Dr. Alberto Coutourier began his work as the first specialist in ophthalmology at the Vargas Hospital of Caracas.

This Hospital is mentioned because of its importance as the outstanding medical center of the Republic and its association with the medical school of Caracas.

In 1918 the first teaching clinic of ophthalmology was founded at the School of Medicine, and was known as the "Catedra Libre de Oftalmologia." At its head was placed the internationally famous Jose Espino, a member of the American College of Surgeons, author of 50 scientific papers, and guiding light in the study of ophthalmology in Venezuela.

Venezuela has two medical schools, one in the Central University of Caracas and one in the University of the Andes in Merida. The curriculum covers six years, the third and fourth of which the students spend as externs in the clinical subjects with the didactic work, and the fifth and sixth years as interns with continuation of lectures, clinics, and laboratory assignments.

The professorships are determined by a competitive examination given by a board of specialists in the particular field.

The number of students admitted to each entering class is limited to 150 and is determined by competitive examination. The National Government underwrites the payment of the tuition and laboratory fees of all professional students. There is a national law in Venezuela that all medical students upon graduation must practice for no less than one year in towns with a population of less than 10,000. The purpose of this law is the proper distribution of medical men throughout the interior.

The undergraduate teaching of ophthalmology consisted of the following subjects:

Anatomy and physiology of the eye are studied in conjunction with the other organs during the first two years. During the fifth year, classes in clinical ophthalmology are held by the Professor, and then three

months are spent in the clinics under the guidance of the Chief of the Clinic and his assistants.

Upon graduation all medical students are required to have a diagnostic knowledge of the more common ocular diseases such as trachomas, glaucoma, iritis, and conjunctivitis and to know the surgical procedures of enucleation, and of complete iridectomy for acute primary glaucoma.

The object of this training is to acquaint the physician with the measures necessary in handling the eye diseases found in the outlying communities far away from medical centers.

Those who wish to specialize in ophthalmology after graduation continue their training at the Vargas Hospital. They attend eye clinics there and at the other institutions and are permitted to assist and perform operations. Preceptorships are common in this field.

A Society of Oto-Neuro-Ophthalmology, comprising members from all over the country, meets in Caracas monthly. Admission to the Society is gained by presenting a scientific paper, and membership is maintained by writing at least one paper annually. All of the papers are published in the Journal of the Society called, "Revista de la Sociedad de Oto-Neuro-Oftalmologia Venezolana," which has a circulation throughout Latin America.

Optometrists are permitted to prescribe glasses. The principal optical houses send technicians throughout the interior of the country, making glasses available to all.

The principal centers of ophthalmology are located in Caracas, Maracaibo (the second city in Venezuela), Barquisimeto, and San Cristobal. Ophthalmology and otolaryngology are almost entirely separated.

To mention some of the unusual mani-

festations of ophthalmologic entities found in Venezuela:

Trachoma is notable for its benign nature, for the rarity of formation of deformities, and the rarity with which it affects the visual acuity.

Conjunctivitis neonatorum is frequent in spite of the mandatory use of the Credé method.

There is an abundance of cases of conjunctivitis due to the Morax-Axenfeld and Koch-Weeks bacilli. The Romagnan syndrome, which consists in a special form of unilateral conjunctivitis with edema of the lids is frequently observed in a tropical condition called Chagas's disease produced by the *Schizotrypanum cruzi*.

We also see, although more rarely, cases of myiasis, filariasis, cysticercosis, and other parasitic diseases.

Although leprosy does not constitute a menace, its ocular manifestations are seen with moderate frequency in the leprosaria. Syphilis is the most frequent etiologic factor in the inflammatory diseases of the eye.

Pterygia are extremely frequent.

Lacrimal stenosis is also more frequent than in the United States.

Diabetic retinopathy is a rare condition, and hypertensive retinopathy is not common.

An intensive campaign is being carried on by the sanitation authorities for the prevention of blindness, the most frequent causes being syphilis, ophthalmia neonatorum, and glaucoma. There are several institutions for the blind.

Ocular surgery is well advanced. In 1919 the first intracapsular-cataract extraction in Venezuela was performed by Dr. Espino by the Smith method.

In 1937, after Arruga's visit to Venezuela, the intracapsular extraction with forceps was adopted by most of our ophthalmologists. The next year Espino and Mendez did the first phakoeresis of Barraquer, which then became the method

of choice in senile cataract.

In 1940 the keratome and scissors incision with Castroviejo's corneoscleral sutures was substituted for the Graefe incision.

In December of the same year the corneoscleral suture of Barraquer was substituted for Castroviejo's suture. Arruga's capsule forceps is used only after several attempts with the suction cup have failed.

Dacryocystorhinostomy is a common operation in Venezuela. Notable is the recent paper of Dr. Jesus Rhode, who reported his results in 51 surgical cases in which he and Dr. Louis Mendez operated, both prominent and well-known specialists in Latin America.

The technique followed was that of Dupuy-Dutemps, with a large opening of the bony wall, 12 mm. high, 8 or 9 mm. wide, made with an electric trephine in two steps: the first one very close to the lacrimonasal duct, the second above and partly inside the first. The anterior two thirds of the opening are situated in front

of the lacrimal crest. Two or three posterior and two or three anterior sutures join the mucous membrane of the nose and that of the sac.

In three cases the epiphora recurred.

For pterygia the methods most frequently used are the simple excision, the McReynolds sutures, and the autoplasties of Terson and Villamizar. Electrocoagulation has not given beneficial results.

The methods of choice in muscle surgery are the reimplantations and resections by means of the Jameson, Lancaster, Landoldt, and Reese techniques.

Surgery for glaucoma as practiced in Venezuela consists of the classic iridectomy to relieve the primary acute form.

For cases of chronic glaucoma the Elliot trephining is the method of choice. Iridotaxis and cyclodialysis have not given good results.

For the past three years, square corneal transplants and superficial keratectomy with and without injection of air have been used in corneal surgery.

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# SOCIETY PROCEEDINGS

EDITED BY DONALD J. LYLE

## NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

May 1, 1944

DR. SIGMUND A. AGATSTON, *presiding*

### BRUCELLOSIS

LT. COMDR. HAROLD J. HARRIS (MC) stated that *Brucella* infection in man is of common occurrence but uncommonly diagnosed. It gives rise to manifold symptoms and a multiplicity of localizations. Uveitis is of fairly frequent occurrence. Involvement of the external ocular muscles, the cornea, the uveal tract, the retina, and the optic nerve has been reported by numerous observers in the presence of positive blood or spinal-fluid cultures. The agglutination test is negative in a majority of chronic infections and therefore the intradermal test and opsonocytophagic test must be used in all illness of obscure origin. Whenever possible, cultural study should also be undertaken, using the special technique essential for the isolation of *Brucella*. Proper evaluation of the various laboratory procedures is of paramount importance. Treatment must be highly individualized. The sulfonamides, fever therapy, blood transfusions, antiserum, and vaccine therapy all have their special indications. *Brucella abortus* vaccine is the treatment of choice in the majority of chronic infections. Disagreement was expressed with the popular concept that brucellosis is a rare disease and that there is no known method of treatment in any event.

### CERTAIN PATHOLOGIC, EXPERIMENTAL, AND CLINICAL OBSERVATIONS CONCERNING THE ETIOLOGY AND TREATMENT OF CHRONIC UVEITIS

DR. CONRAD BERENS drew the follow-

ing conclusions after analysis of his cases: (1) The clinical diagnosis of the etiologic factor in chronic uveitis associated with or unassociated with arthritis is usually presumptive. Comparison of clinical and pathologic diagnoses reported bear out this contention. (2) Bacteriologic and virus studies of the eye, both clinical and experimental, have furnished little exact evidence concerning the causative organisms of chronic uveitis associated with or unassociated with arthritis. (3) The experimental work in animals only indicates that uveal inflammatory lesions and the arthritis can be produced by a number of organisms or bacterial filtrates. (4) At the present time, there are no subjective nor objective tests that can be used definitely to associate a chronic inflammatory eye lesion with a certain infection. (5) Although these studies, so far, are only suggestive of the probable etiology of chronic uveitis, Dr. Berens believes the major part of the problem will finally be solved by the careful correlation of clinical with bacteriologic and virus studies made by groups of specialists whose main interest is in this work. (6) Treatment of chronic recurrent types of uveitis (tuberculosis and syphilis excluded) is disappointing, and although general hygienic treatment and autogenous vaccine seem to lessen the incidence and severity of the attacks, they do not affect a permanent cure. (7) The sulfonamides have been ineffectual in the chronic recurrent types of nonspecific uveitis both in curing the eye condition and in eliminating suspected organisms from foci of infection, especially the sinuses. One exception to this statement has been gonorrheal infection. (8) Penicillin administered intramuscularly has proved to be effective in treating gonorrheal uveal con-



ditions, even those resistant to sulfonamides, and may prove effective in treating uveitis associated with staphylococcal infections. In 20 cases of posterior uveitis, penicillin administered intramuscularly in large doses was ineffectual in curing the lesions. In four patients with anterior uveitis, two seemed to be somewhat benefited by intramuscular injections of penicillin. (9) Repeated aspiration of the anterior chamber and alcohol injections into the ciliary ganglion seem to be beneficial surgical procedures, and iridocorneosclerectomy has an important place if it is difficult to control tension, if synechiae form, or if a cataract is developing.

#### THE ROLE OF STAPHYLOCOCCI IN EYE INFECTION

LT. COMDR. ALSON E. BRALEY (MC) stated that staphylococci are in contact with the body nearly constantly from infancy to old age. If the bacteria are pathogenic, they may give rise to local inflammation. This, in turn, usually sensitizes the individual to their exotoxins. Staphylococci are primarily saprophytes and grow very well on dead skin and sebaceous material. The margins of the eyelids form a good culture medium for the organisms, which are probably transferred there by the fingers and when the factors are favorable set up a local inflammation. This inflammation at first is usually hordeolum or sty, which tends to be multiple and infect adjacent hair follicles, glands of Zeiss or Moll. The numerous local infections sensitize the patient to the exotoxins formed by the bacteria. When other infections by the bacteria occur, the result is usually an acute blepharitis. The individual in cases of this latter infection becomes sensitive to the toxin. The exotoxin formed by some types of staphylococci produce a conjunctivitis without previous sensitization, but after the individual becomes sen-

sitive to the toxin minute amounts of their powerful exotoxin will produce local inflammation.

The first change in the cornea is a mild superficial punctate keratitis produced by the action of the exotoxin alone. After the individual becomes sensitive to the toxin necrosis occurs in the form of the so-called marginal infiltrates. Vascularization of the cornea usually follows these infiltrates and as healing occurs, scars form. The central portion of the cornea remains clear.

*Discussion.* Dr. D. Cappetta inquired whether Comdr. Braley had seen any cases of keratitis associated with skin lesions in the absence of lid or conjunctival involvement.

Comdr. Braley saw no reason why boils, as in the case inquired about, which are recurrent, cannot sensitize the cornea.

#### PENICILLIN THERAPY IN ENDOCARDITIS— DISAPPEARANCE OF EMBOLIC LESIONS IN THE RETINA FOLLOWING ITS USE

DR. WARD J. MACNEAL said that in bacterial endocarditis, embolic hemorrhagic spots in the conjunctiva are of diagnostic and prognostic significance and similar embolic lesions in the ocular fundi are even more ominous symbols of impending disaster in the brain and of early death.

Miss M. F., aged 32 years, had typical mitral endocarditis and consistently positive blood cultures. She had a retinal hemorrhage of the right eye on June 14th, and on July 2d bilateral retinal hemorrhages associated with severe visual disturbance were present. These lesions were again observed four days later. On July 1st she had had a mild stroke with hemiparesis. Visual disturbance was again noted on September 14th. Very minute amounts of penicillin had been used up to this time, but after September 20th the patient received 60,000 units per day for

several weeks. She recovered completely and has no disturbance of vision.

Miss H. S., aged 24 years, had a bacterial endocarditis since April, 1943. She was extremely emaciated, and had a mitral systolic murmur and positive blood cultures. She suffered a series of severe epileptiform convulsions on January 26th, controlled by morphine. On January 27th there was a conjunctival hemorrhage and a central retinal hemorrhage in the fundus of the right eye. Apparently the grave mental state was related to multiple cerebral embolism. Treatment included considerable amounts of penicillin. On February 25th the eyes were normal except for the previous myopia and peripheral myopic chorioretinitis.

*Discussion.* Dr. Martin Cohen, who had followed the ocular status of these patients during their stay in the hospital, described the various lesions, and presented slides illustrating them. He inquired whether there had been mitral regurgitation, stating that a lesion of the retinal artery is generally due to a stenosis and not regurgitation.

Dr. MacNeal, in closing, replied that one cannot always be certain during life of the exact location and nature of the anatomic alterations in the heart. There was at the apex and over the precordium a presystolic murmur and a very loud systolic murmur, which still persisted. He said he thought there was mitral stenosis and regurgitation.

#### A STUDY ON THE CHEMOTHERAPY OF VITREOUS INFECTIONS

DR. LUDWIG VON SALLMANN described experimental studies with penicillin in vitreous infections. A single intravitreal injection of 0.2 c.c. of a 25-percent solution of purified sodium penicillin, which secured a bacteriostatic concentration of the drug in the vitreous fluid for more than 24 hours, caused little or no damage

to the lens and vitreous, and only localized injury to the retina when the injection was placed near its surface. Such an injection checked staphylococcal infections of the vitreous when the treatment was started within 12 to 13 hours after inoculation. The intravitreal injection of the same amount of a 10-percent solution of sodium sulfacetimide, administered six hours after infection, did not influence the course of the inflammation produced by the same strain of mannitol-positive *Staphylococcus aureus*.

*Discussion.* Dr. Karl Meyer discussed the local use of penicillin. In the study presented here the penicillin was processed from surface culture. A second process, that of submerged culture, does not yield as purified a form of penicillin. Until pure penicillin becomes available it might be well to test the material to be used in the inner eye on animals before injecting it into the human eye. It also seems advisable to use for such purposes material of better than 800 Oxford units per milligram.

Dr. Mark Schoenberg considered of importance the fact that Dr. Von Sallmann's work promises to furnish the means of preventing the loss of eyes from infection due to perforating injuries. It would seem to indicate the use of penicillin prophylactically by injection into the vitreous immediately after the entrance of a foreign body or even after a simple perforating injury.

Dr. Martin Cohen pointed out that vitreous infections may not be the primary lesion and asked whether it would be necessary to treat the primary focus to obtain a satisfactory result in such metastatic vitreous infections. He also pointed out that inasmuch as the effect of the penicillin is purely local when injected into the vitreous it would seem to be advisable to treat the organs outside the vitreous.

• Dr. Milton Berliner recalled that when he injected inert matter into animals' eyes he found lymphocytic reactions in the ciliary body and thought that this might be worth considering upon injecting penicillin.

Dr. Von Sallmann concluded by pointing out that penicillin failed in combating vitreous infections after a vitreous abscess had developed when suppuration of the anterior segment was far advanced. It therefore must be used prophylactically or early in infections, although in many of his animals severe signs of inflammation were present in the anterior chamber when successful treatment was begun; in several eyes there was an interval of 5 days to 5 weeks after inoculation of the anterior chamber and the first treatment with penicillin. The complete failure of vitreous infections after 24 hours is partly explained by the advanced stage of destruction of the inner membranes about 30 hours after infection. As for local treatment in the presence of systemic infection, the eye was treated directly because of the small amount of penicillin available and because of the urgency of the condition. In performing the injection the penicillin is placed as far from the retina as possible and care should be taken to avoid injury to the lens.

Leon H. Ehrlich,  
Secretary.

## CHICAGO OPHTHALMOLOGICAL SOCIETY

May 15, 1944

DR. VERNON M. LEECH, *president*

CLINICAL MEETING

(Presented by the Eye Department, Cook  
County Hospital)

ATOPIC ECZEMA WITH CATARACTA NEURO-  
DERMATICA

DR. EFFIE M. ECKLUND said that a 25-

year-old man had had skin symptoms since the age of 10 years. At that time there was mild pruritis in the axillae, antecubital fossae, and in the popliteal space bilaterally. Weeping areas appeared on scratching, which gradually involved the face, neck, and lumbar region. At the age of 20 years, the gradual spread of the lesions had involved the entire body surface except the palms and soles, and these were covered with lesions by the time he was 23 years old. Generalized adenopathy was noted 5 years ago. At that time skin tests showed dermal allergy to many common foods, to several animal emanations and other inhalants. The family history revealed that the patient's father had asthma, his paternal grandmother and a maternal cousin both had asthma and hayfever.

He was admitted to the dermatologic wards of Cook County Hospital on March 21, 1944, for the fifth time since the inception of the disease. The diagnosis of atopic eczema was made, the skin condition being described as "diffuse and angry erythema of the face, neck, body, and extremities, with oozing from the lesions of the extremities."

The patient was seen in the eye clinic on April 13th, with a history of progressive dimness of vision of the right eye for two months, and haziness of the vision of the left eye for two weeks. The vision in the right eye was limited to light perception with good projection; vision in the left eye was 0.4+3 and J6. The external findings were normal in both eyes. There was complete opacification of the lens of the right eye with irregular masses of white amorphous material throughout the lens substance. There was a posterior cortical saucer-shaped opacity of the lens of the left eye and a few fine, dustlike opacities in the anterior subcapsular region. The fundus of the left eye was normal.

## CENTRAL CHORIORETINITIS SEROSA

DR. EFFIE M. ECKLUND presented a woman, aged 58 years, who was seen for the first time in the eye clinic in October, 1943. The vision was R.E. 1.0—2; L.E. 0.8. There had been no history of illness or injury since that time until March 17, 1944, when she noted marked loss of vision in the left eye. On examination, the vision of the right eye was unchanged, and the vision of the left eye was reduced to perception of hand movements. In the fundus of the left eye a detachment of the entire temporal and inferior sector of the retina was seen, extending to and folding over the disc. There were numerous linear white streaks over the detached portion and, in the macular area, a yellowish subretinal haze. No retinal tears were seen. The visual field was reduced to a small area in the inferior temporal sector.

Physical findings, laboratory tests, and X-ray findings revealed nothing of significance. Ear, nose, and throat examination was normal. When last seen the vision of the left eye was 1/100, the detachment had flattened, the yellowish discoloration of the retina over the macular area had disappeared, and a shrinking white fibrous mass lay over a small part of the retina, just superior and nasal to the macula, which drew this area into several large folds. Intraocular pressure had remained normal throughout the period of observation.

## ROSACEA-LIKE TUBERCULIDE WITH KERATITIS

DR. EFFIE M. ECKLUND presented a man, aged 40 years, who had noted at the age of 32 years a little redness over the lower part of both cheeks and the chin. This continued, with exacerbations and remissions, until January, 1944, when the skin lesions spread to the malar promi-

nences and a small area of the right side of the forehead; the left side of the forehead became involved in April. About one year after onset of the skin lesions, his eyes became red and painful, with marked photophobia, which persisted. One year ago he noted a white area over the inner part of the pupillary region of the right eye which had remained with little change until this time. The photophobia and redness of the right eye cleared up spontaneously about three months ago.

When seen in the eye clinic on April 3, 1944, the vision was R.E. 0.8, J1; L.E. 0.1, J4. The right eye showed a deep, diffuse, ill-defined corneal opacity, with abundant deep vascularization, within the nasal half, and a smaller, sharply defined opacity of calcareous appearance, just nasal to the pupillary area. The remainder of the anterior segment and the fundus appeared normal.

There was moderate ciliary injection of the left eye and deep corneal opacities and vascularization of the temporal half, similar to those of the right eye, with a fresh yellowish infiltrate at the apex of the triangular deep involvement.

The question at that time was whether this was a rosacea keratitis or an acid-fast involvement of the cornea. In the dermatologic clinic, two biopsy specimens from the affected skin failed to provide sufficient evidence for a differential diagnosis between acne rosacea and a rosacea-like tuberculide. There was, however, a 3+ reaction to intradermal injection of 0.001 mg. of old tuberculin, and the patient had focal reactions consisting of marked aggravation of the ciliary injection of the left eye and exacerbation of the skin symptoms. These persisted for about two days and were followed by marked improvement of ocular and dermal symptoms.

Laboratory studies were normal. The X-ray picture of the chest showed some

evidence of an old infiltrative process involving the left infraclavicular region, indicating a probable old fibroid, acid-fast infection. On the basis of these findings; dermatologic consultants concluded that the skin disease was a rosacea-like tuberculide.

During six weeks of observation, the vision had improved to R.E. 1.0+3, L.E. 0.6. Because of the correlation between the skin and eye symptoms, and because of the effect of the tuberculin on the ocular manifestations, it was believed that the corneal involvement was also of acid-fast origin.

#### SPHENOID-FISSURE SYNDROME DUE TO POSTDENTAL EXTRACTION OSTEOMYELITIS

DR. WAYNE WONG presented A. S., a woman, aged 33 years, who stated that she had experienced vague right temporal headaches in October, 1943, following extraction of teeth from the right upper jaw. She went into a severe diabetic acidosis and was admitted to the hospital where, about five days later, she developed right facial palsy and paralytic ptosis of the lid of the right eye. No eye examination was made at this time. There was moderate drainage from the right upper jaw, which was treated as Vincent's infection. Biopsy specimen from this area showed a nonspecific granulation tissue; one culture grew *Streptococcus viridans*.

When seen in the eye department on December 7, 1943, there was no light perception in the right eye; vision of the left eye was 1.0. There was complete external and internal ophthalmoplegia of the right eye. Fundoscopic examination showed that the disc was partly covered by an irregular white fibrous band, on the nasal border of which were several areas of venous hemorrhage. The posterior pole appeared as a white edematous area, in the center of which was located the "cher-

ry-red" fovea. The arteries were barely visible except near the disc. The veins appeared collapsed; some contained broken columns of blood.

Serologic tests gave negative results. X-ray films of the skull showed clouding of the right orbital region.

#### ORBITAL-APEX SYNDROME

DR. WAYNE WONG reported two such cases. *Case 1.* R. B., a 17-year-old girl, was seen in the eye clinic for the first time on March 28, 1944, with a complaint of a left-sided headache and a swollen lid of the left eye of two weeks' duration. The vision was 1.0 in each eye. The right eye was entirely normal. The left eye showed a moderate nontender swelling of the upper lid; the bulbar conjunctiva was pale; ocular movements were normal. On April 3d there appeared to be some involvement of the third and sixth cranial nerves. On April 12th, involvement of the third nerve was almost complete, and the pupil of the left eye was dilated. The bulbar conjunctiva showed slight ciliary injection. The slitlamp revealed a fine, dustlike deposit on the posterior corneal surface. Examination of the fundus showed an optic neuritis and an unusual amount of swelling, with considerable venous engorgement and tortuosity. The vision of the left eye was 0.2 at this time.

On April 18th the vision of the left eye was  $-15/200$  and the papilledema was increased to about 4 to 5 diopters, with marked perimacular edema. There was an exophthalmos of 3 mm. of the left eye, measured with the Hertel exophthalmometer. On April 21st the vision of the left eye was 0.3 and there was a definite recession of the papilledema. The only finding of significance was an unerupted first molar of the left upper jaw, impinging upon the deciduous first molar. This was extracted on April 29th, following which there had been gradual re-

cession of symptoms. The patient had been afebrile during the entire hospital stay. Blood and spinal-fluid Wassermann tests were negative. The vision at the time of the last examination was 0.5 in the left eye. The condition was probably secondary to an aseptic orbital periostitis due to the unerupted first molar.

*Case 2.* L. L., a woman, aged 53 years, noted for the first time an obstruction of the left nasal passage about 20 years ago. In August, 1941, following an explosive sneezing episode, some polyps were expelled from the left nostril. Examination revealed extensive polyposis of the left vestibule, and these were removed at different occasions. In September, 1941, the left eye became exophthalmic, and the patient complained of excessive tearing, double vision, and a dull left-sided headache. The exophthalmos increased. A biopsy study of tissue from the left maxillary and ethmoidal sinuses showed transitional-cell carcinoma. On December 12, 1941, an extensive resection of the left maxillary and ethmoidal sinuses was performed, leaving a marked anatomic defect. Immediately following this procedure the vision of the left eye began to deteriorate and was finally lost. The patient was under observation for the next 2½ years, and no recurrence of malignancy was found. Further plastic procedures will be attempted upon enucleation of the left eye.

In addition to the foregoing history, this patient had diabetes, hypertension, and positive serologic findings. The syndrome was secondary to the malignancy of the paranasal sinuses.

#### BILATERAL MACULAR HOLES, SUPERIMPOSED UPON SENILE MACULAR DEGENERATION

DR. WAYNE WONG presented E. S., a woman, aged 65 years, who gave a history of progressive inability to do any close

work for the past two years. The external ocular findings were negative. The tension was 15 mm. Hg (Schiotz) in each eye. The vision was R.E. 0.1, L.E. 0.2, corrected to 0.3 in each eye.

Ophthalmoscopic examination revealed that both disc margins were slightly hazy with a small amount of peripapillary pigmentation. Both macular regions consisted of a red punched-out hole, bordered by a sharply outlined ring, with no pigmentary changes. The process appeared to be more advanced in the right eye. The peripheral fundus was essentially negative. All laboratory tests were negative.

#### TRAUMATIC MACULAR HOLE, LEFT EYE; HYSTERICAL BLINDNESS, RIGHT EYE

DR. WAYNE WONG said that R. K., a man, aged 61 years, was seen in May, 1944, with a history of receiving a blow in the region of the right eye about seven days ago. A few minutes after the injury the vision failed completely. The left eye had been injured by an explosion at the age of 10 years.

The vision was R.E., no light perception; L.E. 0.1. There was a residual ecchymosis of the lid of the right eye and several small patches of subconjunctival hemorrhage of the bulbar conjunctiva. The cornea and anterior chamber were clear. The pupils showed no reaction to light. Examination of the fundus of the right eye showed a normal disc and macula. The essential findings of the left eye consisted of a punched-out macular hole, bordered by a white ring with very little pigmentary change.

The Wassermann test was negative. The peripheral-field studies of the left eye showed a 15-degree central scotoma for red. With the right eye uncovered this central scotoma was absent. This finding suggested an hysterical blindness of the right eye.

## TWO CASES OF VOGT-KOYANAGI SYNDROME

DR. CHESTER D. JOHNSON said that the first patient, a Negress, aged 50 years, complained in March, 1943, of blurred vision and redness of both eyes of three weeks' duration. The vision was R.E. 0.5; L.E. 0.2. There was intense ciliary injection of both eyes, with fresh precipitates on the posterior corneal surface, aqueous beam and cells, pigment deposits over the anterior lens capsule, and numerous fine strands of posterior synechiae. The iridocyclitis responded to neosynephrine and atropine. On April 22d she was admitted to the hospital because the intraocular pressure in the left eye suddenly became too high to register. A paracentesis was performed on this eye. Several defective teeth were removed. Two injections of 50 million typhoid bacilli were given, and three weeks later the tension was 16.5 mm. Hg (Schiotz) in each eye. The vision was 0.2.

In September, 1943, the patient noted white lashes and patches of vitiligo on eyelids, shoulders, and chest. The ocular tension remained within normal limits until December 27th, when it increased to R.E. 51 mm., L.E. 56 mm. Hg (Schiotz). The vision was R.E. 4/200; L.E. ability to see hand movements. Intensive treatment with prostigmine and hyoscine brought the tension down to 18 mm. in each eye temporarily, but an increase to 36 and 31 mm., respectively, occurred after several days. A root iridectomy was performed on the left eye. Histologic examination of the excised piece of iris showed dense nonspecific nodular round-cell infiltration, especially around the sphincter muscle and around the arteries of the papillary portion. The postoperative course was uneventful. There had been no change in the vitiligo following a series of neoarsphenamine injections. Five weeks following operation the ten-

sion was R.E. 56 mm., L.E. 26.5 mm. Medical treatment failed to reduce the tension.

When last examined the vision was R.E. 5/200; L.E. 4/200. In the right eye numerous old pigmented precipitates appeared on the posterior corneal surface. The aqueous was clear so far as could be seen through the corneal edema. There was occlusion and seclusion of the pupil. The anterior lens capsule was drawn into numerous folds by shrinkage of the membrane. In the left eye there were also numerous old pigmented precipitates, with pigment proliferation between the pupillary border and the peripheral coloboma, and some pigment dispersion over the pupillary and colobomatous area. Seclusion and occlusion of the pupil, with the anterior lens capsule drawn into numerous folds, was also present.

A root iridectomy in the right eye, and lens extraction in the left eye, were being considered.

DR. CHESTER D. JOHNSON said that the second patient, a Negro, aged 14 years, came to the eye clinic in August, 1942. He had received medical treatment four months previously in St. Louis, because of diminution of vision, red, painful eyes, and extreme photophobia. One month after onset of symptoms his lashes and brows became gray, accompanied by areas of vitiligo.

Using both eyes he saw hand movements at 2 feet, with accurate projection and color perception. There were several depigmented areas about the face, body, and hair, with a few areas of alopecia on the scalp and grayish-white eyebrows and lashes. The eyeballs showed a 2+ mixed injection. Each cornea showed a deep yellowish-white oval opacity involving the lower three fourths, with a peripheral clear rim. The corneal opacities contained numerous deep vessels, and

portions showed a yellowish xanthomatous appearance. The oval opacity was continuous with opaque white material which practically filled the anterior chamber in the lower and middle portion, leaving a very shallow chamber above. The visible iris was atrophic. No red reflex was present in either fundus. The tension was 18 mm. Hg (Schiotz) in each eye. Audiometric tests were within normal limits. The result of spinal-fluid examination was normal. Mantoux reaction for 1:10,000 O.T. was moderately positive. Complete physical examination, X-ray studies of lungs and sinuses, and hematologic examinations were normal.

On November 13, 1943, an iridectomy was performed but was unsuccessful because of the friability of the iris and later vascularization at the site of surgery, in the right eye. An optical iridectomy on the left eye was being considered.

#### CHORIORETINITIS WITH RETINITIS PROLIFERANS OF UNDETERMINED ORIGIN

DR. CHESTER D. JOHNSON said that since January, 1944, this 13-year-old boy noticed that he was unable to read with his right eye. No other symptoms were noted. There was no associated illness or trauma. The only animal contacts known were cats and dogs.

On examination April 18, 1944, the vision in the right eye was reduced to counting fingers at one foot. The vision of the left eye was 10/10. External ocular findings were normal. The pupils reacted well to light. The media of the right eye were clear; the visible portion of the optic disc was normal. Beginning over the temporal half of the disc was some overlying delicate fibrous tissue, increasing in density toward the macular area, where it condensed into a thick irregularly shaped mass. The top of this fibrous band lay about 4 diopters above the level of the retina. Numerous delicate strands ex-

tended into various directions from the main stem. Through shrinkage and contraction, the superior and inferior retinal vessels were dislocated toward the fibrous mass. There was no evidence of retinal periphlebitis.

In the extreme inferior nasal periphery a similar fibrous lesion overlay a large area of choroidal atrophy, with marginal pigmentary proliferation.

Complete physical and laboratory examinations, including X-ray studies of the chest and sinuses, Wassermann and agglutination reactions, and tuberculin skin tests, were negative. Tests for toxoplasmosis had not been performed as yet.

#### CHRONIC CONJUNCTIVITIS CAUSED BY CYSTOID DEGENERATION OF THE UPPER CANALICULUS

DR. VERNON M. LEECH presented a paper on this subject which was published in this Journal (April, 1945).

*Discussion.* Dr. Harry S. Gradle said that the streptothrix or leptothrix infections of the canaliculus are probably one of the most overlooked conditions. Any unilateral conjunctivitis, even without pus, should make one suspicious of an infection. The presence of streptothrix or leptothrix is probably the irritating factor. Apparently the walls of the canaliculus are not infiltrated by the fungus growth, but the mere mechanical presence and the exotoxins are sufficient to cause irritation of the conjunctiva. This is similar to that caused by molluscum.

Apparently, it is not necessary to split the canaliculus. It is easy to dilate it by simple mechanical pressure and flush out the concretions, which come out as whitish lumps, and only in these lumps can streptothrix be demonstrated. It may not be possible to get rid of all in one sitting. It is advisable to massage well with a glass rod to press them out, followed by irrigation.



Dr. Vernon Leech, in closing, said that the reason he did not hesitate to slit the canaliculus in this case was that there was no connection with the sac. It was a cyst, and there was permanent obstruction.

Robert Von der Heydt.

## ROYAL SOCIETY OF MEDICINE

### SECTION OF OPHTHALMOLOGY

June 9, 1944

MR. FRANK A. JULER, *president*

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### RETINAL LESIONS

MR. MAURICE WHITING presented a girl, aged 15 years, who came to the hospital complaining that the vision in her left eye had been deteriorating during the past two months. Her vision was 6/18 in each eye. In the left eye there was an aggregation of small white spots along the inferior temporal vessels and between the superior and inferior temporal vessels around the macular area. The opinion of one colleague was that it was a retinopathy with a vascular basis; of another that it was probably allied to Coats's disease; and of a third that it was an old vascular lesion. The Wassermann test was negative, and there was no real clue to the cause of the condition.

The white spots disappeared after several weeks and left only a slight patch of degeneration.

*Discussion.* Mr. Juler asked whether it was a retinal or a choroidal condition.

Mr. Whiting replied that the distribution and the edema associated with retinal vessels suggested that it was primarily retinal.

Mr. Juler considered that it might have

been a superficial exudative choroiditis with a secondary edema affecting the retina extensively.

### RETINITIS PUNCTATA ALBESCENS

MR. HUMPHREY NEAME presented E. G., a woman, aged 36 years, who was seen at Moorfields Eye Hospital complaining of night blindness. She stated that she had been seen at the age of eight years with this complaint. Her parents were first cousins, but neither of them was affected. She had no knowledge of this defect in any of her grandparents or uncles or aunts, but said that a brother and two sisters were affected. The brother had three sons none of whom had night blindness.

With lenses the vision was R.E. 6/12, L.E. 6/24. The pupils were equal and active and the eyes free from signs of inflammation. The eyes were examined after the pupils were dilated with homatropine and cocaine. The media were clear. Both fundi showed that the discs were of healthy appearance. There were, however, very numerous pale spots, oval or circular in shape, in both fundi. They were most numerous in a band corresponding roughly with the circumference of a semicircle to the temporal side of each macula, extending above and below the disc. Only a few spots were seen at the nasal side. Some of the spots were partly covered by retinal arteries which crossed anterior to them. Peripheral to this area, in the intermediate zone, were numerous small pigment deposits in the form of dots and short rods. In some parts were denser aggregations of pigment spots of similar form. Toward the temporal periphery in the right eye was an oval area where the large choroidal vessels and intervascular choroidal pigment were more clearly seen, as though superficial choroidal atrophy had taken place, with some increase of pigmentation.

tion peripheral to this. There were other smaller ill-defined areas of choroidal pallor, but nowhere any typical indications of a previous choroiditis. The fundi were of slightly albinotic type.

The visual field of the right eye was irregularly contracted. There was no nystagmus, nor were there any stigmata of congenital syphilis, in teeth, nose, frontal bones, nor any history of bone or joint affections. Hearing was good. The Wassermann reaction was negative.

#### CENTRAL RETINAL LESION

Mrs. V. M. ATTENBOROUGH said that the patient was seen at Moorfields Eye Hospital in February, 1943. He complained of gradual loss of vision in his left eye. His vision was R.E. 6/6, L.E. 6/18. On examination there was some fine pigmentary disturbance at the macula of the left eye. In June, 1943, the vision of this eye had improved to 6/12. The patient was not seen again until May, 1944, when his vision L.E. had failed to less than 6/60. There were a raised mass on the temporal side of the macula and some pigmentary disturbance and edema of the macula itself. The Wassermann reaction was negative. Examination of the ears, nose, and throat gave negative results. Urinalysis was normal; blood pressure 150/95.

In view of the fact that the patient was only 49 years old, Mrs. Attenborough asked for opinions as to whether the mass was inflammatory, degenerative, or neoplastic in character.

*Discussion.* Mr. O. Gayer Morgan said that it had a cystic appearance. If there had been some central vision it would have been worth while performing a puncture.

Mr. Humphrey Neame said that it appeared to be of a very pale milky color, definitely bulging, and reminded him of an earlier stage of a case he had observed

many years ago in which a swelling at the macula was thought possibly to be an early leuco-sarcoma of the choroid. It did not, however, grow as one expected a sarcoma to grow, and after 18 months some small pale spots were seen in the macular area of the other eye and the vision steadily deteriorated.

Mr. B. C. Goulden said that the appearance in the macular region reminded him of that seen in an eye with very massive retinal exudation.

#### MACULAR COLOBOMA

MR. VICTOR PURVIS presented a 14-year-old girl. It was discovered in a routine examination seven years ago that she had a coloboma of the macula of the left eye. There was a large punched-out, circular hole, 3 discs in diameter, with pigmented, overhanging margin and a slight degree of pigmentation in the floor of the colobomatous area. No retina was to be seen in the coloboma. There were a few large choroidal vessels passing diagonally across the floor. The particular point of interest was the extreme ectasia, which he had never previously seen so marked in a coloboma that was lined by choroidal tissue. The case appeared to fall between the first and second groups of Miss Mann's classification. The characteristic gross visual defect was present, vision being only 6/60, with eccentric fixation. There was no relevant family history, and if one agreed with the intra-uterine-inflammation theory of the origin of the condition this coloboma presumably had a choroiditis, as the retinal vessels were forming in the fourth or fifth month. The right eye was normal, vision 6/5.

THE END RESULTS OF OPERATION FOR DETACHMENT OF THE RETINA (WITH A FOLLOW-UP OF 50 SUCCESSFUL CASES)

MR. MONTAGUE HINE gave a full

analysis of the results of operation in 120 cases of retinal detachment. They were completed by November, 1942, so that sufficient time had elapsed to determine the final result in the 50 successful cases. He pointed out that, after excluding a group of 49 cases from one source, in which there was a high percentage of unfavorable risks (30.6 percent successful) the average figure for success could be taken at practically 50 percent for unselected hospital cases, obtained from many sources. He pointed out the danger of compiling statistics too early, several cases relapsing after periods up to six months, and a smaller number proving satisfactory only after an interval of several months.

#### THE REMOVAL OF MALIGNANT TUMORS OF THE IRIS

MR. FRANK A. JULER said that tumors of the iris may be pigmented or non-pigmented. It has been well established that the former usually originate in pigmented nevi of the iris. This has been shown by Collins (1926), and cases have been reported by several authors (May, 1930; Neame, 1942; and Black, 1942).

Cases of leucosarcomata are more rare, and have been collected by Duke-Elder and Stallard (1930), but apart from the absence of pigment they do not seem to differ in histology or malignancy from the more usual malignant melanomata. They often show looped vessels on the surface.

A ring sarcoma of the iris has also been described which infiltrates the tissues in preference to the more characteristic nodular formation, and which is likely to have spread beyond the iris structure.

The malignant melanomata of the iris are relatively mild in their degree of malignancy, and several cases of local removal have been reported in this coun-

try, while the indications have been discussed by both Neame and Black, who have had successful results.

In 1936 he showed before this Section a patient in which local removal was later undertaken. It was a localized, nearly flat growth of the iris in a man of 70 years, and there was no difficulty in removing it by base iridectomy. The anterior chamber was of average depth, and a sufficient section was easily made with a Graefe knife, while the limitation of the tumor to the pupillary half of the iris relieved anxiety about any incomplete removal from the base. The iris was gripped at the side of the swelling, and the mass extruded easily.

The patient was seen six years later, and no recurrence was present. The visual acuity had previously been 6/6 partly, but failed very slowly, owing to the progress of a lens opacity which had been present before the operation.

He reported the following case: On June 18, 1942, A. R., a man, aged 37 years, gave the history that he had been aware of a brown mark in the iris of his left eye for 20 years, and that it had slowly got larger during the past few years.

The vision was 6/6 in each eye. In the iris of the left eye there was a tumor projecting from the surface sector between the 12- and the 2-o'clock positions. It included the whole width of the iris, overlapping the pupillary margin, and just disappearing from view behind the limbus. Its outline was roughly circular, and although the periphery toward the ciliary region could not be seen, the curve of the circumference suggested that it did not extend beyond the iris proper. Its surface was of a dark-brown color, smooth for the most part, with a few depressions. No blood vessels were visible on the surface. There was no apparent tumor of the posterior surface nor

of the ciliary region. The front of the tumor was separated from the cornea by a thin layer of fluid. The rest of the iris was gray colored, except for a few pigmented spots. The tension was normal, the cornea clear, and the eye free from inflammation.

Of opinions expressed by colleagues at Moorfields, four favored removal by iridectomy, two were for excision.

In devising a method for local removal two factors were important: (1) The proximity of the tumor to the cornea precluded the use of a Graefe knife or a keratome in the affected sector on account of the danger of cutting the swelling. (2) The peripheral limit indicated a removal at least as far as the iris base.

On June 29, 1942, under local anesthesia a sclerocorneal suture was inserted and a flap of conjunctiva dissected to the limbus. With a small keratome an incision was scratched in the sclera radially from the limbus along the 2:30-o'clock meridian over a length of 2.5 mm. This was made obliquely, sloping in an upward direction until the anterior chamber and ciliary body were reached. A Sinclair cyclodialysis separator was introduced along the periphery as far as the 12-o'clock meridian, and was pressed well into the angle. The sclera was then incised by cutting down on the separator with a Beer knife.

To remove the tumor an unsuccessful attempt was made to catch the iris margin with a blunt hook laterally and mesially. By means of iris forceps applied to the outer side, however, the tumor protruded readily and was abscised. Some pigmented tissue in the wound was also removed, and histologically was found to consist of normal ciliary processes. Healing was uneventful.

On July 17, 1944, the visual acuity of the eye that had been operated on was 6/9, improved to 6/6 with -1.50D. cyl.

ax. 20°. The eye was quiet, there was a slight subcapsular opacity of the lens opposite the center of the iris coloboma. The tension was normal, and there was no evidence of recurrence. Examination with the gonioscope revealed normal ciliary processes, and no abnormal pigmentation in the region of Schlemm's canal. With the corneal microscope a slight deposit of pigment on the lens equator at the 1-o'clock position and a small pigmented sphere on the iris at the 4-o'clock position have been noted as unchanged for 18 months.

*Histologic report.* The preparations, owing to kinking of the specimen and to wartime deficiencies, left much to be desired. The tumor contained well-formed spindle cells with a considerable amount of collagen and some reticulum formation. The cells were spreading into the iris stroma without a definite capsule, and in places were heavily pigmented. No mitotic figures were seen. It was impossible to say whether removal had been complete.

*Comment.* The described method of removal seemed to offer a good prospect of removing the affected part of the iris to the extreme periphery, and indeed by this method a sector of the ciliary body might also have been ablated, although naturally the suspensory ligament of the lens would sustain partial damage.

It is worth while to collect the indications that point to (1) malignancy of an iris tumor, and (2) to the possibility of removal by iridectomy.

(1) Malignancy is indicated by a history of increasing size, a definite non-translucent protrusion from the anterior or posterior surface, and the absence of inflammatory signs.

Increase of tension also points to malignancy, and is suggestive of extension to the canal of Schlemm.

Flattening of the pupil and loss of its

mobility may be suggestive, but a notch in the pupil is not definite evidence.

(2) Local removal. Extension may be insidious to the ciliary body, the corneal periphery, or the retina. The gonioscope should be useful in excluding extension around the angle on to the corneal periphery, where some abnormal pigmentation might be seen. For this examination it would be necessary that the tumor did not fill the anterior chamber sufficiently to obscure the view through the gonioscope.

Increase of tension would be a definite contraindication to local removal as also would any evidence of ciliary involvement. It has to be remembered that incomplete removal may produce rapid filling up of the eyeball with growth, as

in a case described by Greenwood (1929), in which extension soon involved the eyelids.

The therapeutic application of radium as an alternative or additional measure has to be considered. It is unlikely that the slow-growing spindle cells found in these cases are likely to be radio-sensitive. Doses would have to be severe, and damage to the eye would be likely to accrue. Neame applied it in one of his cases as a treatment after iridectomy. A 5-mg. plaque was applied for one hour on two occasions, and considerable discomfort occurred up to three years later. Stallard (1933), on the other hand, states that intraocular sarcomata are very sensitive, and he reports a good result.

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## OPHTHALMOLOGIC TRAINING FOR RETURNING VETERANS

In the July 7th issue of the Journal of the American Medical Association, on page 757, there is an outline of graduate continuation courses in ophthalmology offered for physicians from July 1, 1945, to July 1, 1946. An analysis of these with a discussion of how well they will meet the demands of the returning veterans may prove of interest.

For several months in the early part of 1945, medical officers in the armed services were circularized to determine what kind of postgraduate medical instruction they would like to have upon their release to civilian life. Some 5,000 replies were

received. Of these approximately three quarters desired some form of specialized training. Fifty-seven percent wanted courses of six months or longer and 19 percent sought short refresher courses. A division into age groups is further enlightening: Among those who were graduated from medical schools between the years 1920 and 1929—that is, the older group of officers—about half of those who desired training wanted long courses and half wished refresher courses; however, in the group of younger physicians—graduated between 1941 and 1945—more than 4,000 were hoping for courses of more than six months' duration, whereas less than 300 wanted the

short refresher course. The reasons for the difference in aim would obviously seem to be that the older men had neither the time nor the inclination to undertake basic training but merely wished to bring up to date their knowledge of newer procedures and to brush up on the familiar methods that they had not used during their period of war service.

The Department of Ophthalmology of Washington University, has received an increasing number of requests from medical officers for courses after demobilization. In the last few months each week has brought several requests, 41 in all since May. The majority of these officers have not specified the type of course they desired, but have merely expressed a wish for postwar training and a request for information regarding the courses that would be offered. However, of those who have stated the type of instruction wanted, most have indicated the wish for extensive training. In this group should be included those who have asked for internships. The difficulty of supplying the demand throughout the country is going to be great. A threefold problem confronts ophthalmic centers; namely, provision for internships, long graduate courses, and short refresher courses.

In an effort to provide internships, Washington University Hospitals have agreed to increase their internes in all branches by 100 percent. It is recognized that this will increase expenses, will divide the available work, and scarcely allow sufficient material for each house officer's education. Concerning the expense, much will be assumed by the Army under the G.I. Bill of Rights. The service in ophthalmology will be less attractive than in normal times because the available surgical material will be divided.

Presumably other hospitals are preparing to increase the numbers of their

internes in like manner, but even with this expansion many of the returning medical officers are going to be disappointed because the demand for internships will still far exceed the supply.

These men must, therefore, turn to the long basic courses which can provide a partial substitute for internship, but these should continue to be, as heretofore, merely preliminary to residencies. The greatest disadvantages inherent in these as definitive training is their brevity, the limitation of practical handling of eye patients, and the absence of surgery on human eyes. Animal eyes are obviously only a poor substitute, since their anatomy and physiology are so dissimilar and with these the very important aftercare cannot be taught. However, students in graduate courses will have access to hospital wards, and with adequate "rounds" they can learn to a considerable extent the follow-up on surgical patients.

Turning now to the consideration of postgraduate courses now listed, eight universities or hospitals offer training. In these the length of course varies from 2 days to 12 months, and only three offer courses of more than 1 month. The number of possible registrants is not given, but if the plan is similar to the prewar plan, not more than 50 and probably considerably fewer places are open in courses of 6 months or more. It is feared that this will be entirely inadequate. To help meet the emergency the Washington University Department of Ophthalmology has just decided to renew its eight-months' course this fall and will be able to train 16 students. This course is not included in the published lists cited.

It must be recognized that many hospitals and medical schools are so burdened with their present schedules and depleted staffs that courses that they can offer this year will be limited by these

factors, and that other long courses can be made available only as soon as the members of the hospitals and faculties who will return from service can again help to carry the burden now borne by the older members of their staffs.

The American Academy of Ophthalmology and Otolaryngology has appointed a committee to study this very subject, but as far as the writer is aware, no action has been taken. Studies are also being made by the A.M.A. and by the College of Surgeons. However, thus far, apparently no group has made a serious effort to find out just what each unit could offer and to correlate the efforts to render the aid most effective and to extend these teaching facilities as far as possible. It would seem that it were high time that this should be done, since already a few medical officers are being discharged and the problem will be present in an acute form very shortly. Even as this is being written word comes of the end of the Japanese war, so that the time for delay is past and every medical school and hospital must immediately plan to stretch its facilities to the utmost to provide places for these homecoming physicians who have a right to demand and will demand that they be given opportunities for training.

Lawrence T. Post.

### THE NATIONAL SOCIETY FOR THE PREVENTION OF BLINDNESS

Most of us know of the National Society for the Prevention of Blindness, but its character, scope, purpose, and possibilities may not be sufficiently familiar to many who could be helped by it and who could make use of its facilities.

The origin of the Society can be dated from the appointment of a special Commission by the Governor of New York,

in 1907, to investigate the conditions of the blind. Fortunately, the chairman of this Commission was the late Dr. Park Lewis of Buffalo. The report of the Commission fell under the notice of a group of public-spirited men and women and led to the promotion, under the auspices of the Russell Sage Foundation, of a New York State Committee for the Prevention of Blindness, afterwards the National Committee—ultimately renamed the National Society for the Prevention of Blindness.

The Society has no branches, but functions from a central office at 1790 Broadway, New York. It maintains close and helpful relations with state societies for the prevention of blindness, early ones being formed in Illinois, Kentucky, and Maryland. Of later date is the St. Louis Society for the Blind, which has prevention activities as a major part of its objectives. An important function of the National Society is to act as a clearing house for these societies and other interested voluntary and official agencies for the exchange and dissemination of information, and assistance in planning programs directed toward the saving of sight.

The president of the Society is a prominent New York attorney, a member of the firm which has represented the Society since 1918. Among its board of directors, numbering 30, are eminent educators, social workers, and scientists of whom 14 are physicians and 1 a renowned scientist in physiologic optics. A competent staff conducts affairs from headquarters.

One of the early activities of the Society was its campaign to prevent ophthalmia neonatorum. The Society is one of the active agencies responsible for reducing the incidence of blindness from ophthalmia neonatorum in schools for the blind from 28 percent in 1908 to 3.4 percent today.



Another notable activity was its promotion of sight-saving classes, which grew in number from 2 in 1913, to 609 at the beginning of 1945. The Society has participated continuously in the preparation of teachers for such classes.

An active glaucoma program has been carried on under the direction of the Society's committee on glaucoma, of which the late Dr. Mark J. Schoenberg was chairman. This committee was also instrumental in the establishment of a station for the standardization of tonometers, which is now being carried on by a committee of the American Academy of Ophthalmology and Otolaryngology. An important part of the Society's program has been demonstration of the use of medical social workers in eye clinics, and the training of such workers. A notable example of the use of medical social workers has been in glaucoma clinics.

Another aspect of its work has been its campaign for the protection of the eyes in industry, prominently featured in its conferences and programs as well as in its publications, moving pictures, and other educational media.

A Conference on Industrial Ophthalmology was held in May, 1945, in which the Society coöperated with Columbia University in arranging and conducting a program presenting the various facets of the subject to a group of leading medical educators in the United States. Among the subjects discussed were: Eyesight in industry, Illumination, The character of work with reference to vision and refraction, Protective devices, Color vision, The use of color as a visual aid, Welding, Toxic agents in industry, and others. The list of subjects indicates the wide diversity of the problem of safeguarding and utilizing eyesight in industry.

In its industrial program the Society coöperates closely with the Joint Committee on Industrial Ophthalmology of

the American Medical Association and the American Academy of Ophthalmology and Otolaryngology. It is also privileged to have full coöperation from the United States Public Health Service, the United States Army, the United States Navy, the Federal Security Agency, the United States Maritime Commission, the United States Civil Service Commission, and other governmental and voluntary agencies.

In step with the times, the Society is now concerned with the rehabilitation and reëducation of the visually handicapped (not blind) when the visual defects make such a program advisable.

It may be seen from this brief résumé of some of the major activities of the Society that it is not a case-work agency, but rather seeks to reach the individual by helping, through its facilities and counsel, those organizations that are working directly with the individual. In line with this policy, the Society has frequent opportunity to refer individuals seeking advice and guidance to the proper agency.

Among the publications issued or sponsored by the Society are the 320-page "Eye hazards in industry," by Louis Resnick and the 216-page "Education and health of the partially seeing child," by Winifred Hathaway; a 149-page volume on "Industrial aspects of ophthalmology," as well as the quarterly journal, *The Sight-Saving Review*, an annual report, and numerous pamphlets used in its educational program.

The Society is in a financially sound condition, thanks to the fact that legacies, donations, and other sources of income have been wisely administered; and while it spends each year more than its income from contributions, the difference is made up from the reserve created from legacies and special gifts. It is not the aim of the Society to amass a large endowment, but

by wise use of its funds to do the most good for the greatest number with the means at its command, and to husband these resources to the end that its good works may continue.

E. C. Ellett.

### SOCIEDAD OFTALMOLOGICA HISPANO-AMERICANA

Than Spain, no other country has more conspicuously swung from success and world power to disaster. After soaring to great heights of glory and responsibility in her vast colonial empire, she has been shorn of well-nigh all her former territorial possessions.

Within a few years of the expulsion of the Moors from the Iberian peninsula, Spain's explorers subjugated much of North and most of Central and South America. Her language became the cultural medium of millions of aborigines and of other millions of descendants of those who had migrated to the Americas from countries of Western Europe. Yet in rapid succession these colonies and possessions, following the example of the British settlements along the Atlantic seaboard, made themselves independent of the mother country.

At the height of her greatness, Spain formed a part of one of Europe's most powerful empires. Under the Hapsburgs, who at one time held also Austria, the Low Countries, and most of Italy, Spain was the strongest bulwark of the Catholic Church. Notwithstanding this fact, perhaps the literature of no other country has so abounded in frank criticism, and even ridicule, of its religious personages and institutions. Many of the more important misfortunes of Spain are attributable to the seesaw between republicanism and monarchism and between religious orthodoxy and independent thinking.

Santiago Ramon y Cajal, philosopher as well as scientist, shares with some other writers a disposition to blame a good deal of Spanish decadence during the sixteenth and seventeenth centuries upon the "cruel and unpolitic expulsion of Jews and Moors, and the incomprehensible exemption from contributory charges of the clergy and nobility, in whose hands rested almost all the wealth of Spain. . . ." As additional causes Ramon y Cajal mentions "continuous intrusions into the politics of foreign countries, with which we exhausted our strength and wasted the treasures of America." The same author quotes Cánovas as saying that "there was always, even in the zenith of our power, enormous disproportion between our resources and our enterprises."

The Moors of Spain were leaders in medieval science. In the modern scientific era, including the field of medicine, Spain has not generally played so conspicuous a part as some other European countries. But as regards nervous anatomy and physiology, medicine owes a tremendous debt to Ramon y Cajal and his school, whose researches on the structure of the nervous system of man and vertebrates, and concerning degeneration and regeneration of the nervous system, were revolutionary and far-reaching. Ophthalmologists, especially, base a great part of their knowledge of the optic nerve and of the optic tracts and centers upon Ramon y Cajal's scientific activities.

During and between international upheavals, the national medical organizations of the different countries have played an important part in scientific progress, serving sometimes for announcement and discussion of new discovery and methods, and always for the stimulation of contacts between brilliant minds. Even during wars, human intelligence and the scientific spirit struggle to assert themselves. Thus, from the most

récent of Spanish civil wars came certain contributions to the melancholy science of ocular and other disturbances due to starvation, as it was experienced in besieged Madrid.

The International Congress of Ophthalmology held at Cairo, Egypt, in December, 1937, would have been the natural occasion for a good deal of incidental travel in Spain, especially on the part of travelers from the United States. However, the possibility of such travel was destroyed by the outbreak of the Franco or Falangist revolution against the newly elected Spanish Parliament, to which were attributed extremes of hostile action against the Church and other national institutions. The bitter civil war which followed, and which ended with the supremacy of Generalissimo Franco, had an important repercussion in relation to ophthalmology in Spain.

As previously recorded in this Journal (1944, volume 27, page 86), Spanish ophthalmologists waited for four years before the Falangist government felt it safe to permit them to hold a national reunion. This year will probably see the fifth of such gatherings since the ban was lifted. Fortunately, our Spanish colleagues have been permitted to issue reports of their transactions, in "Archivos de la Sociedad Oftalmologica Hispano-Americana (successor to the "Archivos de Oftalmologica Hispano-Americanos" of pre-civil-war days). It is now forty-two years since the modest beginning of this important organization by a handful of Spanish ophthalmologists, who at first had little more to work with than enthusiasm for the advancement of their science.

In the past quarter of a century, Spanish ophthalmology has made important contributions to the specialty, the names of Arruga, Barraquer, and Márquez being particularly well known outside their own country. Since the end of the Civil

War, Arruga and Barraquer have resumed their activities in Barcelona, while Márquez remains for the present in Mexico.

Under the able editorship of M. Márquez, the pre-civil-war "Archivos" was one of the best eye journals of Europe. Fortunately, political troubles and four years of enforced silence have not prevented the creation of an equally admirable new "Archivos," under the editorship and administration of B. Carreras Durán, Director, and M. López Enríquez, Secretary of the Society. The rest of the editorial staff comprises H. Arruga, N. Belmonte Gonzáles, J. Casanovas, A. García Miranda, C. Garrigosa, S. Latorre, G. Leoz Ortín, L. Mier, A. Moréu, and J. Pallarés. Editorial supervision is excellent, the printing good, and the illustrations fairly numerous and usually well reproduced. The literary and scientific quality of the articles compares favorably with that of other leading eye journals of the world.

The bulky bimonthly issue (278 pages) dated September-October, 1944, and received (under the difficult conditions of the war in Europe) about the middle of last April, contains a report on last year's Congress of the Society and over one hundred pages of excellent original articles, including a paper by Arruga on a new diathermy apparatus for treatment of retinal detachment, a paper by Palomar Palomar on Vogt's cyclodiathermy in the treatment of hydrophthalmos, a paper by Belmonte González on ocular tension and retinal circulation during pregnancy, a lengthy and well-illustrated paper by Suárez Villafranca on surgery of the eyelids, and a further Arruga paper dealing with experimental and clinical investigations with penicillin in ophthalmology.

The charming "Impresión" which introduces the official record of the Society's annual transactions is written by G.

Leoz Ortín, of Madrid. It is characterized by literary grace and distinction which are reminiscent of Spain's outstanding position in the world of letters. In addition to the seven scientific sessions held under the presidency of Arruga, there were numerous social activities, rendered more picturesque by the fact that the whole Congress was conducted in the shadow of the Alhambra. Concerning the enchantment and deeper significance of this gem of medieval Moorish architecture, Leoz Ortín rhapsodizes in rather vague terms at the close of his narration. Perhaps intentionally, perhaps unintentionally, his language suggests thoughts that he does not utter. Several centuries ago the Moors, whose civilization had produced many poets, philoso-

phers, and scientists, were expelled from Spain. Some of us may be prompted to reflect as to the events surrounding more recent expulsions in which the modern Moors played a strangely different part. But let us rejoice that, in spite of political upheavals, Spain's ophthalmologists are alert and progressive and are maintaining the best scientific and fraternal traditions of the profession.

W. H. Crisp.

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#### ERRATUM

In the July, 1945 issue of this Journal the title of Dr. Ralph I. Lloyd's paper was erroneously printed "Binocular and red-free ophthalmology" instead of ophthalmoscopy.

# ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

## CLASSIFICATION

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|--|--|
| 1. General methods of diagnosis                        | 10. Retina and vitreous                                |
| 2. Therapeutics and operations                         | 11. Optic nerve and toxic amblyopias                   |
| 3. Physiologic optics, refraction, and color vision    | 12. Visual tracts and centers                          |
| 4. Ocular movements                                    | 13. Eyeball and orbit                                  |
| 5. Conjunctiva   | 14. Eyelids and lacrimal apparatus                     |
| 6. Cornea and sclera                                   | 15. Tumors   |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries   |
| 8. Glaucoma and ocular tension                         | 17. Systemic diseases and parasites                    |
| 9. Crystalline lens                                    | 18. Hygiene, sociology, education, and history         |
|  | 19. Anatomy, embryology, and comparative ophthalmology |

### 2

#### THERAPEUTICS AND OPERATIONS

Filatov, V. P. Tissue therapy in ophthalmology. *Amer. Rev. Soviet Med.*, 1944, v. 2, Oct., p. 53.

Excised animal tissues preserved at low temperatures and plant tissues stored in dark places produce and accumulate biogenic tissue stimulators. These are the weapons of the protoplasm in its fight for survival under unfavorable biologic conditions. Such biogenic tissue stimulators are similarly produced during active disease processes, in order that the tissues may survive, and with intensification of the disease the stimulators may be produced in such overwhelming quantity that they even may suppress the disease factor itself. The phenomenon of crisis in infectious diseases may thus be explained. The biogenic stimulators produced or introduced into the body accelerate cellular metabolism, aid in the absorption of scar tissue, stimulate regenerative processes, and increase the physiologic function of an organ.

Material for biogenic tissue stimulators may be obtained from human cadavers, living donors, and vegetable plant. The material is removed within ten hours after death and is transferred into a dry sterile bottle and kept at a temperature of 2 to 4 C. for seven days. Skin is taken with its subcutaneous tissue, the latter being removed before transplantation. Cadaver blood is taken from the superior vena cava. The aqueous extract of placenta is very rich in biogenic tissue stimulators. The blood and placenta extracts are fractionally sterilized before they are stored. Cod-liver oil and aloe when preserved for five to six days at a temperature of 2 to 4 C. become rich in biogenic tissue stimulators.

Tissue extracts are injected subconjunctivally or subcutaneously ten to fifteen times at 48-hour intervals. Organ tissues, homologous or from rabbit, sheep, or calf, are implanted subconjunctivally. Favorable results were obtained in a wide variety of diseases; such as ulcerative blepharitis, recurring hordeoli, vernal conjunctivitis,

trachoma, interstitial keratitis of various etiology, herpetic keratitis, tuberculosis of the cornea, uveitis, retinitis pigmentosa, optic-nerve atrophy, and glaucoma. Corneal opacities cleared up, inflammatory processes regressed sharply, and there was a tendency to more rapid recovery. R. Grunfeld.

Ginsburg, M., and Robson, J. M. The effect of detergent on the penetration of sodium sulfacetamide (albugid soluble) into ocular tissues. *Brit. Jour. Ophth.*, 1945, v. 29, April, pp. 185-193.

A series of experiments to determine whether the penetration of sulfonamides applied locally to the eye can be increased by a wetting agent is reported. Ten-percent solutions of sodium sulfacetamide were used with duponal, a detergent derived from technical lauryl alcohol in 0.1-percent solutions. Experiments were carried out on living rabbits and on isolated ocular tissues. No significant difference between the results of the experiments in vivo and in vitro were found except that as regards the conjunctiva there was a higher concentration of the drug in the isolated eye. This difference is probably due to the fact that in the living animal appreciable amounts of the drug are taken by the blood passing through the vascular conjunctiva.

There was a great increase in the penetration of sodium sulfacetamide into and through the cornea when used with duponal. Removal of the corneal epithelium caused a great increase in penetration of the sulfonamide. The epithelium acts as a barrier to passage of the drug. Removal of the corneal epithelium did not increase passage of the drug into the cornea. The wetting agent acts by overcoming the epithelial barrier.

It is shown that by use of a deter-

gent it is possible not only to increase the concentration of sodium sulfacetamide in the anterior ocular tissues but also to prolong the period during which effective chemotherapeutic concentration is maintained. The results suggest that a combination of sulfonamide and detergent might be of value in local treatment of infections in the anterior segment of the eyeball. (1 table, 3 diagrams, references.)

Edna M. Reynolds.

Poyales. The combination eucodal-scopolamine-ephedrine in ophthalmology. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, May-June, pp. 365-368.

In order to obviate the disadvantage of morphine-scopolamine in preparation for surgery a combination of eucodal-scopolamine-ephedrine is used. Eucodal is dihydroxycodone, a derivative of codeine which is more analgesic and less toxic than morphine. To counteract the depression of the respiratory center caused by eucodal-scopolamine, ephedrine or ephedrine, which stimulates the respiratory and cardiovascular centers, is added. No untoward reaction has been noted when this combination of drugs is used. The face appears slightly congested and cyanotic. The blood pressure is at first normal but later may be lowered somewhat. After hypodermic injection, this analgesic effect begins within 15 to 20 minutes. Sleep or semisleep lasts from eight to twelve hours. As the effects wear off there is no excitation.

J. Wesley McKinney.

Poyales. Short wave in ophthalmology. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, May-June, pp. 369-373.

The local effects of short wave which are made use of in ophthalmology are production of heat in the tissues, active hyperemia, local anesthesia, and spasmolysis. The best results are obtained in suppurative affections of the ocular adnexa, particularly acute dacryocystitis and lid abscesses. The pain of iridocyclitis is lessened by short wave, as is also that of acute glaucoma. Short wave is excellent for promotion of absorption of retinal and vitreous hemorrhage after the danger of further bleeding has passed. In cases of neuralgia of the first division of the trigeminal the results are discordant. Cases apparently identical may be made better or worse. There are two contraindications to wave therapy. The first is the presence of a tumor which may be activated by the short wave; the second, the presence of metallic foreign bodies which by concentration of the current may produce burns.

J. Wesley McKinney.

### 3

#### PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Alvarado, Pedro. Schematic explanation of apparent movements of immobile objects seen through a lens in movement and vice versa. *Bol. del Hosp. Oft. de Nuestra Señora de la Luz*, 1945, v. 3, Jan.-April, pp. 15-18.

The author discusses such apparent movements in regard to different types of lenses. (2 diagrams.)

Burian, H. M., and Ogle, K. N. Aniseikonia and spatial orientation. *Amer. Jour. Opth.*, 1945, v. 28, July, pp. 735-743. (3 figures, references.)

Fink, W. H. An evaluation of visual-acuity symbols. *Amer. Jour. Opth.*,

1945, v. 28, July, pp. 701-711; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42, p. 49. (6 figures, references.)

### 4

#### OCULAR MOVEMENTS

Pelayo y Martin del Hierro, Manuel. Technique and results in one hundred operations for convergent strabismus. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, May-June, pp. 424-429.

The author uses the resection technique of Blaskovics for the external rectus. Resection of one or both external recti combined with tenotomy of one internal rectus is practiced depending on the degree of the squint.

J. Wesley McKinney.

### 5

#### CONJUNCTIVA

Bland, J. O. W. Spontaneous folliculosis of the conjunctiva in baboons. *Jour. Path. and Bact.*, 1944, v. 56, July, p. 446.

Six baboons developed spontaneous folliculosis of the conjunctiva. In two of them the follicles were as numerous and as severe as in a trachomatous reaction. The condition seems curable. It is not known whether it is infectious or transmissible. It is not related to trachoma nor transmissible to man. The ease with which these animals are stricken with this disease in Egypt makes them poor subjects for trachoma research. Francis M. Crage.

Höhr Castan, José. Superficial epidemic keratoconjunctivitis. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, May-June, pp. 343-350. (See Section 6, Cornea and sclera.)

Pearson, G. H. A review of eye disease in Central China. *Brit. Jour.*

Ophth., 1945, v. 29, May, pp. 260-268. (See Section 18, Hygiene, sociology, education, and history.)

Somerset, E. J. Self-inflicted conjunctivitis. *Brit. Jour. Ophth.*, 1945, v. 29, April, pp. 196-204. (See Section 16, Injuries.)

Staz, L. A modification and extension of the McReynolds operation for pterygium. *Brit. Jour. Ophth.*, 1945, v. 29, April, pp. 193-196.

The following modifications in the McReynolds operation for pterygium are suggested: (1) Subconjunctival injection of novocaine and adrenalin into the lower fornix as well as into the site of the pterygium. (2) Prevention of overlapping of the conjunctiva along the upper limbus after implantation of pterygium. (3) Formation of a conjunctival flap to cover the raw scleral area and to lie along the limbus without encroaching on the cornea. In this way is formed a vertical barrier to prevent recurrence of the growth of horizontal vessels on to the cornea. (3 diagrams.)

Edna M. Reynolds.

## 6

### CORNEA AND SCLERA

Höhr Castan, José. Superficial epidemic keratoconjunctivitis. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, May-June, pp. 343-350.

This article is principally a review of the literature up to 1941, setting forth the experiences of European observers with epidemic keratoconjunctivitis.

J. Wesley McKinney.

Malbrán, Jorge. Keratoplasty in Groenouw keratitis. *Arch. de Oft. de Buenos Aires*, 1943, v. 18, April, p. 191.

The author reports two cases of the

granular type of Groenouw corneal dystrophy occurring in two sisters, in whom a perforating keratoplasty following Castroviejo's technique was performed. In one of the cases recovery was uneventful; in the other, localized ectasia at the line of junction of the graft and the cornea developed as a result of increased intraocular pressure, which subsided after a paracentesis. Vision improved from 1/10 to 3/10 in each case. (4 illustrations.)

Plinio Montalván.

## 7

### UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Alger, L. G. The cause and treatment of poor vision in aniridia. *Amer. Jour. Ophth.*, 1945, v. 28, July, pp. 730-735. (7 figures, references.)

Casanovas, J. Significance of vessels in the interlamellar area of the uvea. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, May-June, pp. 412-418.

The author calls attention to a layer of tissue consisting of fine bundles situated between the retinal-pigment layer and the lamina vitrea. It extends from the ora serrata as far as the equator posteriorly. Several photomicrographs are shown to illustrate the condition. The cases studied seem to show that blood vessels appear in this tissue as a result of inflammatory disease of the uvea.

J. Wesley McKinney.

Kautz, F. G., and Schwartz, I. Intracranial calcium shadows: choroid ossification. *Radiology*, v. 43, Nov., p. 486.

The authors' findings bear striking similarities to others in the literature. Usually there is a shrunken eyeball, a large central area of which is occupied



by a well-delineated, fairly regular, ovoid, circular or semicircular, dense though not strictly homogeneous calcium shadow. This occupies the lens region and extends more frequently into the posterior than into the anterior part of the bulb. At times it assumes the shape of a ring. Description of seven cases follows.

Francis M. Crage.

Sugar, H. S. Glaucoma and essential progressive atrophy of the iris. *Amer. Jour. Ophth.*, 1945, v. 28, July, pp. 744-748. (1 illustration, references.)

Vidal, F., and Malbrán, J. L. Studies on the chemical composition of the aqueous humor of the cat. *Arch. de Oft. de Buenos Aires*, 1943, v. 18, April, p. 202.

In this article, the first of a series concerning the chemical composition of the aqueous humor of the cat, the authors discuss at length the different theories on the origin and nature of the aqueous humor and finally consider it as a dialysate, in accordance with Donnan's theory. (Bibliography.)

Plinio Montalván.

## 8

### GLAUCOMA AND OCULAR TENSION

Goar, E. L., and Potts, C. R. Some observations on the treatment of glaucoma. *Texas State Jour. of Med.*, 1945, v. 40, Feb., p. 535.

The authors emphasize the need for early operation in acute glaucoma. If miotics do not improve the condition within a few hours, iridectomy must be performed. The authors' choice is iridectomia ab externo. Its technique is described in detail. It is recommended also for simple glaucoma, and for sub-acute glaucoma or the prodromal stage

in which the tension stays high and the patient is constantly on the verge of an acute attack. It has the following advantages over the usual filtering operations: The anterior chamber is evacuated slowly, giving the eye time to readjust itself to the lowered pressure. The instrument does not enter the eye and thus the lens is not in danger of becoming injured. The incision is made at the base of the iris. The anterior chamber is reformed within 24 hours, thus hypotony with resulting malnutrition of the lens is avoided. A wick of iris is left in the wound to insure constant drainage. R. Grunfeld.

Guyton, J. S. Choice of operation in eyes with primary glaucoma and cataracts. *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1945, 49th mtg., March-April, pp. 216-225.

Forty-four cases of chronic noncongestive, congestive, and acute congestive glaucoma were studied. In noncongestive glaucoma uncontrolled by miotics, anterior fistulizing operations with deferred cataract extractions apparently afford the best results. If controlled by miotics, combined cataract extraction is the operation of choice because intraocular tension is also generally lowered. In chronic congestive glaucoma, an initial combined cataract extraction usually offers as much chance of controlling tension as a previous anterior fistulizing operation with subsequent lens removal. In acute congestive glaucoma preliminary iridectomy with subsequent cataract extraction is the operation of choice if tension is high. If tension is lower, or the lens is greatly swollen, combined cataract extraction is usually indicated, without preliminary glaucoma iridectomy. Cataract incisions made through an anterior fistulizing bleb should have

no bad effect. The cataract incision should be made below the bleb if tension is low, and through the bleb if tension is normal. Charles A. Bahn.

McGarry, H. I. Results of surgical treatment of acute congestive glaucoma. *Illinois Med. Jour.*, 1944, v. 86, Nov., p. 269.

From gonioscopic and clinical evidence it is concluded that failure of an iridectomy to control the intraocular pressure in a case of acute congestive glaucoma is in all probability due to the presence of extensive unbreakable peripheral anterior synechiae. Iridectomy, therefore, in contradistinction to iridencleisis and corneoscleral trephining, is only suited for the early stages of acute congestive glaucoma. Both iris inclusions and trephining are successful in a very large percentage of acute congestive glaucomas irrespective of their duration. Small iris incarceration combined with basal iridectomy has become the operation of choice in the hands of the writers.

Theodore M. Shapira.

Moreu, Angel. Concept of preglaucoma and its diagnosis. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, May-June, pp. 313-342.

The author makes an exhaustive study of all patients past fifty years of age who complain of vague visual disturbances. A number of diagnostic phenomena associated with the preglaucomatous state are discussed. If the conjunctival vessels near the limbus are observed with the slitlamp after instillation of zinc sulphate or intravenous injection of nicotinic acid, intermittent dilatation of the arteries is seen in the preglaucomatous eye, whereas in the normal eye the dilatation is constant. As this phenomenon

exists in the absence of ocular hypertension, it is thought to be a purely circulatory disturbance. Gonioscopy often reveals pigment deposits on the corneoscleral trabeculum. Pupillary reactions tend to be lazy and show rapid dilatation even to weak mydriatics. Red-free ophthalmoscopy using the carbon arc may reveal minute congestive foci in the choroid which may be made to disappear by the action of vasodilator drugs. The problem of vascular disturbances in the uveal tract in the pathogenesis of glaucoma is discussed in some detail and a number of tests are described to determine the condition of the uveal capillaries. The light threshold is diminished and dark adaptation retarded. The angiostoma in the preglaucomatous eye presents two notable characteristics. It is smaller than normal in the zone of the arteries and larger in the zone of the veins; and it is very variable. The article has many graphs showing results of the various tests.

J. Wesley McKinney.

Reese, A. B. Deep-chamber glaucoma due to the formation of a cuticular product in the filtration angle. *Trans. Amer. Ophth. Soc.*, 1944, v. 42, pp. 155-166. (See *Amer. Jour. Ophth.*, 1944, v. 27, Nov., p. 1193.)

Schoenberg, M. J. A report on the progress of the glaucoma campaign during the past three years. *New York State Jour. Med.*, 1945, v. 45, April 1, p. 738.

An outline is given of the program conceived in 1942 to publicize the glaucoma problem and to establish clinics for better diagnosis and treatment of glaucoma. Thus far some special clinics have been established. Checking stations for the standardization of tonom-

eters have been established in New York, Chicago, and San Francisco. Exhibits, papers, and radio talks have fostered interest. Further education in the importance of glaucoma is needed for layman, general practitioner, and optometrist. More ophthalmologists must become interested in special glaucoma clinics. Trained professional perimetrists are needed. Medical social services are needed to provide continuous care and supervision of the patients. Funds for research should be made available. The aid of all oculists must be enlisted in the campaign against glaucoma.

Robert N. Shaffer.

Sugar, H. S. Glaucoma and essential progressive atrophy of the iris. *Amer. Jour. Ophth.*, 1945, v. 28, July, pp. 744-748. (1 illustration, references.)

Villalpando, E. D. Functional and degenerative glaucoma. Data for its diagnosis, classification, and treatment. *Bol. del Hosp. Oft. de Ntra. Sra. de la Luz*, 1943, v. 2, Jan.-Dec., pp. 59-131.

This is a 73-page article, in Spanish, well written, but in the nature of a general review of the subject, and with emphasis surgically on the use of hemicyclodialysis (see abstract of paper by Enrique Graue, Jr., above). The grooved cyclodialysis spatula of Torres Estrada is illustrated. Five cases treated with hemicyclodialysis are described. (10 illustrations, references.)

W. H. Crisp.

## 9

### CRYSTALLINE LENS

Allen, T. D. Congenital glaucoma and cataract, bilateral; goniotomy and needling. *Trans. Amer. Ophth. Soc.*, 1944, v. 42, pp. 308-314. (See *Amer. Jour. Ophth.*, 1945, v. 28, April, p. 388.)

Arruga, H. Details of technique in the operation for cataract as regards instrumentation. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, May-June, pp. 351-353.

A brief review of the advances made in the past 15 years toward perfecting instruments used in cataract extraction.

J. Wesley McKinney.

Basterra, J. How failures of capsular forceps are lessened. Our second model of capsular forceps. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, May-June, pp. 354-359.

A capsule forceps the blades of which are inclined toward each other at an angle of  $45^\circ$  gives the most efficient grasp of the lens capsule. By comparing this with other forceps it was found that many more tight capsules could be grasped with the author's model. Thus more intracapsular extractions were possible.

J. Wesley McKinney.

Cañamares Moreno, S. Intracapsular cataract extraction with the suction apparatus of Arruga. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, May-June, pp. 360-364.

In 58 cases of cataract extraction the suction apparatus was used. The lens was delivered intact in 56 or 96.5 percent. This high percentage of total extraction was accomplished with loss of vitreous in four cases, hernia of vitreous in six cases, and subluxation of the lens in one case.

J. Wesley McKinney.

Guyton, J. S. Choice of operation in eyes with primary glaucoma and cataracts. *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1945, 49th mtg., March-April, pp. 216-225. (See Section 8, Glaucoma and ocular tension.)

Herrmann, H., and Moses, S. G. The cytochrome oxidase activity of the lens of bovine eyes. *Jour. Biol. Chem.*, 1945, v. 158, March, p. 47. (See Section 19, Anatomy, embryology, and comparative ophthalmology.)

Mann, I., and Pirie, A. The effect of ascorbic acid on the occurrence of hyphema after cataract extraction. *Brit. Jour. Ophth.*, 1945, v. 29, April, pp. 175-179.

To determine the effect of ascorbic acid on the prevention of postoperative hyphema, prophylactic administration of ascorbic acid in cataract extraction was carried out during 1943-1944 and the results were compared with those of the preceding year in the Oxford Eye Hospital.

In 1942-43, 78 cataract extractions showed occurrence of hyphema in 25.6 percent. In 1943-1944, only 39 cataract extractions were done but the percentage of hyphema was 30.7 percent. Saturation of the patient with ascorbic acid was not found to decrease the incidence of hyphema after cataract extraction, all other conditions remaining the same. (2 tables, references.)

Edna M. Reynolds.

Robbins, B. H. Dinitrophenol cataract in the chick; effect of age. *Jour. Pharm. and Exper. Therapeutics*, 1944, v. 82, Nov., p. 301. (See Section 19, Anatomy, embryology, and comparative ophthalmology.)

## 10

### RETINA AND VITREOUS

Bedell, A. J. Angioid streaks in the deep layers of the retina. *Amer. Jour. Ophth.*, 1945, v. 28, June, pp. 601-612; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42, p. 288. (13 figures, references.)

Beiras García, Antonio. Experiments with artificial circulation in the vascular territory of the ophthalmic artery in the cadaver—its possible interest as a method of study. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, May-June, pp. 419-423.

In four cadavers, after removal of the brain at autopsy, fluid was injected into the ophthalmic artery by means of a canula. The pressure in the artery was regulated to simulate the normal blood pressure. The procedure resulted in restoration of the normal relationship of the intraocular and orbital structures. This method has a practical application in anatomical studies, in teaching, or in experimental ocular surgery. It may possibly have some value in physiologic investigations.

J. Wesley McKinney.

Gözcü, N. I., and Ogen, C. A case of posterior detachment of the vitreous, accompanied by a hole in the retina. *Göz Klinigi*, 1944, v. 2, no. 3, pp. 51-56.

A month after diathermal coagulation for a retinal detachment with a peripheral retinal tear, the patient showed a ring-shaped cloud immediately above the disc, and measuring two disc diameters in diameter. The cloud moved with every movement of the head, and was diagnosed as representing a posterior vitreous detachment with a hole. The retina and its arteries were clearly visible around the openings. (1 photograph.)

W. H. Crisp.

Gutmann, Adolfo. The pressure of the central retinal artery in allergic disorders. *Arch. de Oft. de Buenos Aires*, 1943, v. 18, April, p. 185. (See *Amer. Jour. Ophth.*, 1943, v. 26, p. 783.)

Lee, R. H., Finch, E. M., and

Pounds, G. A. Periodic fluctuations in the dark-adapted threshold. *Amer. Jour. Physiology*, 1945, v. 143, Jan., p. 6.

Periodic fluctuations in dark-adaptation curves, especially near the terminal threshold, have been observed in a number of cases. Binocular tests usually show greater changes in amplitude of fluctuation than monocular or alternate monocular tests. The amplitude and period of fluctuation may vary from day to day but are remarkably similar when the same subject is tested twice with a half-hour rest period between tests. The magnitude of the fluctuations is sufficient to account for the "frequency-of-seeing" curves obtained when dark adaptation is measured at the terminal threshold by repeated stimuli and the number of correct responses related to brightness of stimulus. R. Grunfeld.

McGregor, I. S. Macular coloboma with bilateral grouped pigmentation of the retina. *Brit. Jour. Ophthalm.*, 1945, v. 29, March, pp. 132-136.

A case of retinal pigmentation unusual in the wide bilateral distribution of pigmentation spots and associated with a macular coloboma in the right eye is reported. The pigmentation spots were arranged in wedges in all four quadrants of each eyeground, following the main retinal vessels. The size and shape of the dots varied from small black dots near the disc to larger, paler, crescentic round or polyhedral patches nearer the periphery. The right eye showed a roughly circular coloboma, much larger than the disc, with a non-pigmented base and a pigmented border. The sclera was not ectatic, and retinal vessels passed smoothly over the surface of the defect.

The literature on central choroiditis of infants is briefly reviewed. It is

suggested that a fetal inflammation destroyed the macula and gave rise to the surrounding pigmentary changes, these changes assuming the characteristics of grouped pigmentation with growth at the equator during the last weeks of pregnancy. (2 diagrams, references.) Edna M. Reynolds.

Morgan, M. W., Jr., Mohny, J. B., and Olmsted, J. M. D. Observations on retinal blood flow with the aid of Kukan's ophthalmodynamometer. *Amer. Jour. Ophthalm.*, 1945, v. 28, July, pp. 749-750. (References.)

Nuri Fehmi Ayberk. Lawrence-Moon-Biedl syndrome in two brothers. *Göz Klinigi*, 1944, v. 2, no. 3, pp. 58-61.

In these two brothers, aged seven and eight years, all the symptoms of the syndrome were clearly present (adiposis, genital hypoplasia, retinitis pigmentosa, mental retardation, and polydactyly of feet and hands. The parents and grandparents of the children were first cousins. Wassermann and Kahn tests were negative in the children and in their parents. Radiography showed the sella turcica to be smaller than normal. Examination of the blood showed subnormal hemoglobin, and the author states that most of the cases in the literature show this condition as a constant symptom. (1 photograph.) W. H. Crisp.

Prior Guillem, Antonio. Syndrome of Terson. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, May-June, pp. 408-411.

The syndrome consists of a massive vitreous hemorrhage consecutive to subarachnoid hemorrhage. A case is reported, but unfortunately no autopsy was obtained.

J. Wesley McKinney.

Simonson, E., Blankstein, S., and Carey, E. J. Influence of selected spectral distribution on the glare effect, studied by means of dark adaptation. *Amer. Jour. Ophth.*, 1945, v. 28, July, pp. 712-724. (5 tables, 4 graphs, references.)

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Carroll, F. D. Recurrence of tobacco-alcohol amblyopia. *Amer. Jour. Ophth.*, 1945, v. 28, June, pp. 636-639. (1 table, fields, references.)

Cerboni, F. C., and Diez, M. A. Unusual disposition of myelinated fibers. *Arch. de Oft. de Buenos Aires*, 1943, v. 18, Feb., p. 97.

A case of myelinated fibers in the fundus of the left eye is reported. The patch of myelinated fibers occupied the posterior pole and encroached upon the borders of the papilla, leaving a funnel-shaped opening through which the emergence of the central retinal vessels could be seen. The literature concerning this condition is briefly discussed. (Illustrations, bibliography.)

Plinio Montalván.

Langdon, J. M., and Mulberger, R. D. Visual disturbance after ingestion of digitalis. *Amer. Jour. Ophth.*, 1945, v. 28, June, pp. 639-640.

Loewenstein, Arnold. Aberrant optic nerve fibers found between retina and hexagonal cells. *Brit. Jour. Ophth.*, 1945, v. 29, April, pp. 180-185.

Two cases of aberrant fibers of the optic nerve close behind the retina are reported. In the former, the eye showed the presence of a dark tumor of the optic nerve slightly infiltrating the retina at one side. Histologic examination of the eye showed that the sub-

retinal tissue was composed of nerve fibers which could be followed up into the optic nerve, where they turned sharply. The retina over the growth showed only the anterior layers but the retinal structure close to the tumor was completely normal including the neuroepithelium. This case is regarded by the author as one of malignant degeneration of a pigmented nevus of the optic nerve.

The second case of aberrant nerve fibers behind the retina occurred in a hypertensive retinopathy with edematous swelling of the disc. A big "druse" bulged the fibers of the optic nerve over the end of Bruch's membrane and pushed optic-nerve fibers between the retina and the pigmented epithelium. The greater mass of this subretinal tissue was characterized by the presence of huge cytooid bodies. The retina in front of this tissue was well developed.

Optic-nerve fibers aberrant in the orbit have been reported previously, but no other case of aberrant nerve fibers within the eye has been described. (1 fundus photograph, 8 photomicrographs, references.)

Edna M. Reynolds.

Veasey, C. A., Sr. Concerning the early ocular symptoms of multiple sclerosis. *Amer. Jour. Ophth.*, 1945, v. 28, June, pp. 640-644.

12

VISUAL TRACTS AND CENTERS

Bender, M. B., and Furlow, L. T. Phenomenon of visual extinction in homonymous fields, and psychologic principles involved. *Arch. Neurol. and Psych.*, 1945, v. 53, Jan., p. 29.

Following a gunshot wound in the right occipitoparietal region, a 24-year-

old marine suffered from global aphasia, right hemiplegia, and apparent hemianopsia. Craniotomy was performed and the wound was cleared of fragments of bone. Subsequently the hemiplegia disappeared, spontaneous speech returned, and the hemianopsia receded. But the patient still showed some psychic changes, and he was unable to see in his right homonymous field when an object was simultaneously exposed in his left field of vision, although as soon as the stimulus in the left field was removed he perceived the object on the right. Tested for separately, the object in the right field appeared mostly clear but sometimes blurred and dull, seeming to fluctuate in distinctness.

The authors explain the phenomenon by rivalry, dominance, and attention mechanisms which are normal functions of the cortex. The visuosensory cortexes are in competition with each other and are in equilibrium when at rest. If one cortex is diseased there will be no appreciable decrease in perception of an object held in the pathologic field as long as there are no new or strong stimuli in the normal field of vision. If stimuli are thrown into the intact field, the rivalry mechanism becomes apparent, and furthermore the function of the defective cortex becomes dominated by the normal cortex. Thus the acuity of vision in the affected field is decreased, with dulling and obscuration or even complete extinction of the form, color, and image perceived by the affected field.

R. Grunfeld.

Bender, M. B., and Furlow, L. T. Visual disturbances produced by bilateral lesions of the occipital lobes with central scotomas. *Arch. Neurol. and Psych.*, 1945, March, p. 165, v. 53.

A patient whose occipital lobes were extensively damaged from a gunshot wound was at first completely blind. Peripheral vision then appeared and continued to improve, terminating at bilateral 15° central scotomas. During this period the patient showed good perception of movement, defective color vision, and hemeralopia, with the normal psychologic mechanism of filling in of visual-field defects, so as to perceive familiar objects as a whole. Though using peripheral vision entirely he continued to see objects "straight ahead" and could hardly be convinced that central vision was absent. Later his psychologic field of vision became reorganized about a new functional fovea and he was then willing to relinquish his old pattern of vision. Entoptic phenomena with visualization of emanating "waves" and fluctuation of perception in the remaining field of vision were noted. The production of optomotor nystagmus was possible in the peripheral but not in the central fields of vision. After-imagery could not be obtained in any part of the visual field.

Robert N. Shaffer.

Coverdale, Howard. Hysteria in ophthalmology. *Brit. Jour. Ophth.*, 1945, v. 29, March, pp. 120-124.

Ninety-five cases of hysteria with ocular symptoms among 58,927 New Zealand troops are reported. Fifty were considered severe and 45 mild. The average age was thirty years. A high proportion had some pre-existing ocular defect, dating in most cases from childhood. The 45 milder cases were referred back to their units with reassurances. Forty-two of the fifty severe cases were repatriated to New Zealand and eight were regraded to base.

Edna M. Reynolds.

Fonte Barcena, Anselmo. Visual disturbances in tumors of the temporal lobe. *Anales de la Soc. Mexicana de Oft. etc.*, 1944, v. 19, Jan.-June, pp.1-16.

Upon the basis of a group of clinical experiences, the author rejects certain views expressed by Cushing and others with regard to the diagnostic significance of symptoms related to tumors of the temporal lobe. According to Fonte Barcena, neoplasms of this region are to be divided into tumors of the anterior half and tumors of the posterior half. Lesions of the anterior half produce asymmetric homonymous hemianopsia (either quadrant or complete), incongruous, and almost always involving macular vision by reason of remote compression of the optic tract; whereas neoplasms of the posterior half produce symmetric homonymous hemianopsia which is congruous, usually partial, and usually sparing macular vision, by virtue of lesion "in situ" of the geniculo-calcarine fasciculus or radiations. (Bibliography.)

W. H. Crisp.

Kravitz, D., and Stockfisch, R. H. Wernicke's disease (encephalitis hemorrhagica superioris). *Amer. Jour. Ophth.*, 1945, v. 28, June, pp. 596-600. (References.)

Perlman, H. B., and Case, T. J. Mechanisms of ocular movement in man: Influence of the vestibular apparatus. *Arch. of Otolaryng.*, 1944, v. 40, Dec., p. 457.

Movements of the eye may be: (1) voluntary (frontal cortex); (2) reflex optic (occipital cortex activated by a retinal image); (3) reflex vestibular (activated by end organs in the labyrinth). Voluntary movement is made so rapidly that no blurred retinal image is perceived. Ability to hold lateral de-

viation is dependent on good vision, with cortical and cerebellar tone. Tonic muscle reflexes tend to pull the eyes back toward center. This slow pull produces a blurred retinal image and a stimulus to get the eyes back to the point of original fixation, resulting in nystagmus with the slow component toward the center. In cerebellar disease the reflex neural mechanisms for maintaining deviation are disorganized and the eyes tend to return to the central position. Hence nystagmus tends to be greatest looking toward the side of a cerebellar lesion.

Lesions in the quadrigeminal plate interfere with vertical deviation of the eyes, resulting in inability to raise the eyes above center or inability to maintain them above center, the effect being a vertical nystagmus. Motor fibers that enable the eyes to turn toward an object in the periphery, and that control fusion, convergence, and so on, originate in the occipital cortex. This is also the source of the motor fibers permitting the eye to follow a moving object, so-called optic kinetic nystagmus. In some frontal cortical lesions, the fixation reflex becomes accentuated and the patient can only pull his eyes away from the area of interest by closing them. If there is asymmetry in the neural stimuli from the vestibular systems, the resulting inaccuracy causes blurred retinal images and subjective dizziness.

Most normal demands for movement of the eyes can be accomplished by a subject with no vestibular function. However, stimulation of the vestibular end organs results in slow conjugate deviation away from the center. In the presence of spontaneous vestibular nystagmus, more marked eye movements occur when the eyes are deviated toward the side of the quick component



than when in the direction of the slow component.

Robert N. Shaffer.

### 13

#### EYEBALL AND ORBIT

Basterra, J. **The Mules operation.** Arch. de la Soc. Oft. Hisp.-Amer., 1944, v. 4, May-June, pp. 374-379.

The advantages stated for the Mules operation are a normal conjunctival sac, better motility of the lids, no sinking of the orbital tissue, and better mobility of the prothesis. The esthetic effect is, therefore, considered better than following simple evisceration or enucleation. J. Wesley McKinney.

Gradle, H. S. **Enucleation versus evisceration.** Trans. Amer. Acad. Ophth. and Otolaryng., 1945, March-April, pp. 225-226.

The three major reasons for removal of an eye are elimination of danger to sight or life, the elimination of pain, and improvement of appearance. Each reason indicates the most suitable type of operation. Simple enucleation, enucleation with implant into the muscle cone, simple evisceration, and evisceration with implant into the scleral capsule each has its indication. From a cosmetic standpoint, they are advised in the following order: (1) Evisceration with implantation of fat, glass, bone, or gold ball into the scleral capsule; (2) simple evisceration without later implant (usually very satisfactory); (3) enucleation with implantation of fat or solid ball into the muscle cone (gives a better cosmetic result than simple enucleation).

Charles A. Bahn.

Inside a glass eye a partial vacuum exists, causing the glass eye to collapse at its weakest point, which is the concave posterior portion. If the glass eye breaks while in the orbit, the individual hears the sound of an "explosion," the inrush of air into the cavity of the glass eye. The glass eye is then removed from the orbit with difficulty, for the soft parts are sucked into the cavity of the glass eye. The pieces which are broken off lie always in the cavity of the eye. R. Grunfeld.

Herrmann, H., and Moses, S. G. **Content and state of glutathione in the tissues of the eye.** Jour. Biol. Chem., 1945, v. 158, March, p. 33.

Reduced glutathione is found in various tissues of the eye in the following amounts, stated in mg. per 100 gm. of tissue: lens cortex, 388 to 570; lens nucleus, 64 to 100; corneal epithelium, 78 to 178; corneal stroma, 3.6 to 7.1; retina, 50 to 108; ciliary body, 21 to 39; iris, 14 to 33; aqueous, 0. No oxidized glutathione was detected in tissue extracts, but if extracts of lens nucleus, ciliary body, or iris were reduced with  $H_2S$  the amount of reduced glutathione increased 50 to 100 percent.

Corneal epithelium and lens cortex have high reducing capacity, whereas retina, ciliary body, and iris are less active. The reducing system of the cornea consists of a heat-stable and a heat-labile component. The latter contains the enzyme. The heat-stable fraction could be replaced by analogous extracts from other tissues, especially the liver. Glucose and cozymase could not be used to replace the heat-stable factor. R. Grunfeld.

Kirby, D. B. **Enucleation of the eyeball with immediate implantation into Tenon's capsule.** Trans. Amer. Acad.

Hayes, W. M. **Collapse of glass eyes in the orbit.** Amer. Jour. Surg., 1945, v. 67, March, p. 510.

Ophth. and Otolaryng., 1945, 49th mtg., pp. 229-235.

- In uncomplicated cases, evisceration of the eyeball is not considered the operation of choice. Eight to ten c.c. of 2-percent novocaine is used with a minimum of adrenalin. If general anesthesia is employed, 5-percent glucose in normal saline is given hypodermically, intravenously, or by rectoclysis to avoid dehydration. The tendons are cut close to the eyeball and the eye fixed with two small angular bi-pronged scleral hooks. Severe pressure and hot moist gauze packs are not advised to prevent bleeding, because they delay healing. Tenon's capsule is preferably closed with a suture and the conjunctiva sutured separately with plain catgut. Irregular-shaped implants have no advantage over spheres. If implants are used, portions of Tenon's capsule found in the four oblique positions between the four recti muscles are used for the double overlapping procedure. Two 0000 chromic catgut sutures of the mattress type are used, inserted at right angles to form a cross. Care is advised that the tarso-orbital fascia be not included in the sutures. Three or four mattress sutures are used to close the conjunctival wound horizontally. (8 illustrations.) Charles A. Bahn.

O'Brien, C. S. Enucleation and substitute operations. Trans. Amer. Acad. Ophth. and Otolaryng., 1945, March-April, pp. 227-229.

In all types of operation the conjunctiva should be preserved lest the cul-de-sac be shortened. In simple enucleation without implant the recti muscles and Tenon's capsule are brought together by a purse-string suture. Intrasceral implant in properly selected cases affords the best cosmetic result. Hospitalization is longer, post-

operative reaction is increased and extrusion of the implant occasionally occurs. After excision of the cornea a small triangular area of sclera is removed from above and below to favor more accurate coaptation of the scleral edges over the implant. Cauterization of the inner surface of the sclera has not been found necessary. An incision around the optic nerve may be made to favor drainage of blood from the intrasceral cavity. Detachment of the nerve from the sclera increases the motion of the sclera. The implant should not be too large or too small and is preferably fat, fascia, bone, glass, or gold. Guist's bone sphere is not advised. Fine white silk sutures are placed vertically and close to the cut margin, to avoid overlapping. The fascia bulbi is sutured horizontally, as is the conjunctiva. If the implant is lost, a delayed implant operation is advised. If an intrasceral implant is contraindicated, an implant into Tenon's capsule is considered the next choice. Delayed implant operations, properly performed in suitable cases, improve the cosmetic result, though motility is usually much limited.

Charles A. Bahn.

Pfeiffer, R. L. Effect of enucleation on the orbit. Trans. Amer. Acad. Ophth. and Otolaryng., 1945, 49th mtg., pp. 236-237.

Roentgenographic study of 31 patients shows that removal of the eye arrests the growth of the orbit, leads to contraction, and reduces capacity. The earlier in life the eye is removed, the smaller will be the orbit when full growth is attained. This deformation of the orbit is less if an implant is used. Orbital contraction follows enucleation even in adults, the space being taken up by the neighboring sinuses. Facial asymmetry, though not always strik-

ing, follows enucleation in children. (2 roentgenograms.)

Charles A. Bahn.

Puig Solanes, M., Oropeza, J., Garduno, E., and Fonte Barcena, A. Syndrome of retraction of the eyeball (Duane syndrome). *Anales de la Soc. Mexicana de Oft.*, etc., 1944, v. 19, Jan.-June, pp. 18-27.

Three cases are reported. (1) A man of 19 years showed enophthalmos and slight narrowing of the right palpebral fissure, with fairly good vision. There was slight convergence of the left eye in the primary position, and upon gazing to the right there was defective abduction of the right eye with increased narrowing of the left palpebral fissure. Upon looking to the left, there was absence of left abduction, with slight right enophthalmos and slight narrowing of the right palpebral fissure. (2) A girl aged five years, retarded as to walking and speaking, was unable to move the right eye to the right; and she further showed left enophthalmos and reduction of the left palpebral fissure upon looking to the right, while upon looking to the left there was left enophthalmos and reduction in the right palpebral fissure. (3) In a man of 19 years, the right eye deviated outward, and had a diminished palpebral fissure and slight enophthalmos. The vision was decidedly subnormal, adduction was absent for either eye, the left eye moved downward and outward when the right eye fixed, the left eye showed narrowing of the palpebral fissure with enophthalmos and elevation of the left eye upon looking to the right, and the right palpebral fissure narrowed, with enophthalmos and downward movement, upon attempting to look to the left. (8 photographs, references.)

W. H. Crisp.

Walsh, F. B., and Dandy, W. E., The pathogenesis of intermittent exophthalmos. *Trans. Amer. Ophth. Soc.*, 1944, v. 42, pp. 334-354. (See *Amer. Jour. Ophth.*, 1944, v. 27, Dec., p. 1463.)

## 14

### EYELIDS AND LACRIMAL APPARATUS

Paula Xavier, J. de. Blepharitis and mercurochrome. *Arquivos Brasileiros de Oft.*, 1944, v. 7, Dec., pp. 323-324.

In the absence of pyoctanine, frequently recommended for the purpose, the author has used with advantage, in a number of cases of blepharitis, the repeated painting of affected portions of the lid margin with mercurochrome solution. The disfigurement caused by the stain may be disguised with tinted lenses. (References.)

W. H. Crisp.

## 15

### TUMORS

Arnau Maorad, Mariano. Hydatid cyst of the orbit diagnosed sarcoma. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, May-June, pp. 387-391.

Differentiation of hydatid cyst from sarcoma of the orbit is very difficult, especially in view of the extreme rarity of the former. A case is reported wherein exenteration of the orbit was begun for a supposed sarcoma. Upon finding a large cystic cavity the eye was enucleated and the contents of the cyst with its lining were removed.

J. Wesley McKinney.

Goldsmith, A. J. B. Secondary carcinoma in the anterior chamber. *Brit. Jour. Ophth.*, 1945, v. 29, March, p. 136.

Secondary carcinoma was growing in the anterior chamber after the manner of a tissue culture. Beside the

presence of carcinomatous deposits free in the anterior chamber, there were such deposits also in the root of the iris in the ciliary body, in the choroid, and in the sclera. The patient, a woman aged 64 years, had had a radical mastectomy on the left side a year before the onset of ocular symptoms. In the anterior chamber of the enucleated right eye, tumor cells had burst through the iris root and were proliferating into the anterior chamber, where they covered almost the whole anterior surface of the iris in a thick layer having no connection with the iris stroma. Isolated tumor cells were lying on the posterior corneal surface. (4 illustrations, references.)

Edna M. Reynolds.

Walker, J. D. Recurrent juvenile papilloma of the conjunctiva. *Amer. Jour. Ophth.*, 1945, v. 28, July, pp. 751-754.

## 16

### INJURIES

Adam, A. L., and Klein, M. Electrical cataract. *Brit. Jour. Ophth.*, 1945, v. 29, April, pp. 169-175.

A case is reported in which 11,000 volts of electricity passed through the body by sparking contact with metal-rimmed spectacles. Second and third-degree burns were present around the orbits and other burns were present on the shoulder, neck, and face. Visual symptoms developed six months after the accident. Two years after the accident there were lens opacities in both eyes, mostly vacuoles in the anterior capsule with a scale-like grey opacity on the left anterior capsule. There were also subcapsular grey dots, which were in some places confluent. Vitreous and fundi were normal. General examination was negative except for a moder-

ate increase in blood pressure. Vision without correction was 6/18 in each eye. This was corrected to 6/12 with lenses. The patient was kept under observation for 16 months, during which time the eye condition remained stationary.

The literature regarding cataract due to electric shock is reviewed and discussed. There has been a gradual increase in the number of cases reported during the last eight years. The evidence collected to date is not sufficient to enable us to state the cause of electric cataract or the process by which it develops. (3 slitlamp photographs in color, references.)

Edna M. Reynolds.

Argüello, D. M., and Tosi, B. Subconjunctival luxation of the lens. *Arch. de Oft. de Buenos Aires*, 1943, v. 18, April, p. 179.

The authors report two cases of traumatic rupture of the eyeball with subconjunctival luxation of the lens. In the first case the rupture took place at the 9-o'clock level of the limbus, and the dislocated lens, with some uveal tissue, was situated under the bulbar conjunctiva on the nasal side. One and a half months later, after the rupture had healed, the lens was removed surgically; but ten days after the operation ciliary injection and keratic precipitates appeared in the other eye. The injured eye was enucleated immediately and pathologic examination showed the typical picture of sympathetic ophthalmia. The inflammation in the uninjured eye, however, gradually cleared up. In the second case rupture of the globe took place in the upper portion of the corneoscleral limbus and the dislocated lens was found under the bulbar conjunctiva on the nasal side. Extraction of the lens was done early

in this case; there was a small loss of vitreous at the time of operation, but postoperative recovery was uneventful. The authors emphasize the poor visual prognosis in this type of injury as well as the great danger of sympathetic ophthalmia. (Illustrations, photomicrographs, bibliography.)

Plinio Montalván.

Costenbader, F. D. Foreign body in the lacrimal sac. *Amer. Jour. Ophth.*, 1945, v. 28, July, pp. 754-756. (4 figures.)

Dean Guelbenzu, D. M. Double ocular perforation by a foreign body. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, May-June, pp. 381-386.

A foreign body perforated the cornea and the root of the iris, and passed into the orbit near the ora serrata. Through the ophthalmoscope, a hole could be seen in the retina, choroid, and sclera. Five months later vision equaled 1.00 with some difficulty. J. Wesley McKinney.

García Nocito, P. F., and Zubillaga, J. B. Glass splinter in the anterior chamber. *Arch. de Oft. de Buenos Aires*, 1943, v. 18, April, p. 195.

In reporting the case of a patient with a glass splinter in the anterior chamber consecutive to the explosion of a chlorine flask, the authors discuss the different surgical procedures for extraction of foreign bodies from the posterior surface of the cornea, the iris, and the angle of the anterior chamber. (5 illustrations, bibliography.)

Plinio Montalván.

Lodge, W. O. Intraocular foreign bodies. *Brit. Jour. Ophth.*, 1945, v. 29, April, pp. 205-208.

A method of projection for eyes in

which the vision is good but in which the foreign body is too far forward to be seen with the ophthalmoscope is described and illustrated with diagrams. The author recommends that because of the possibility of spontaneous absorption, lens surgery be delayed for a year following removal of a foreign body from the lens. (4 illustrations.)

Edna M. Reynolds.

Neblett, H. C. Blunt trauma to the eye and orbital wall. *Southern Med. and Surg.*, 1944, v. 106, Nov., p. 436.

Acute glaucoma occurred in a man aged fifty years, two months after a blunt brow injury. Cure with good vision followed surgery. In a second case delayed changes in vitreous, optic nerve, and macula followed apparent cure of intraocular hemorrhage six months earlier. Four months after an injury considered trivial, a large hole in the macula reduced the vision permanently to hand movements. The last case reported was one of recovery three weeks after secondary glaucoma from a massive intraocular hemorrhage. Francis M. Crage.

Rooks, Roland. Bactericidal lamp conjunctivitis. *Jour. Iowa State Med. Soc.*, 1945, v. 35, April, p. 140.

Ultraviolet disinfecting lamps are installed in hospital wards, nurseries, and operating rooms. The danger of direct exposure of the eyes to the lamp rays is well recognized. The author investigated to what extent rays reflected from walls or floor surface became harmful. A tantalum photocell, which clicked once for each exposure of 200 microwatt seconds per square centimeter, was used for measure. One staff member, who previously had suffered three attacks of conjunctivitis by direct exposure, exposed himself deliber-

ately, up to the dosage of 15 clicks, to the rays coming from the lamp reflector. That night he suffered from a severe conjunctivitis. Taking 15 clicks as a basis, it was found that, measured at a distance of five feet, the lamp reflector emitted enough rays in  $3\frac{1}{2}$  hours to register 15 clicks. When the lamp was placed at a distance of one foot from but facing the wall, and the photocell at a distance of two feet, 15 minutes exposure was necessary for registration of 15 clicks. Under the same conditions a hard-surfaced wall reflected more rays. When the lamp was faced downward at a distance of one foot above a smooth concrete floor, and the photocell was placed  $3\frac{1}{2}$  feet above the floor,  $3\frac{1}{2}$  hours was needed for registration of 15 clicks. The author recommends directing the rays toward a soft-finished ceiling, and he warns against irradiating the floor in an occupied room.

R. Grunfeld.

Skeoch, H. H. Penetrating war wounds of the eye and orbit. *Brit. Jour. Ophth.*, 1945, v. 29, March, pp. 113-120.

Early recording of vision is emphasized. Diagnostic trial of a known intraocular foreign body with the giant magnet is deprecated because when negative it means nothing and when positive it means that additional injury has been done to an already damaged eye. Routine radiologic examination is recommended even if a foreign body can be seen within the eye. The equatorial-ring method of X-ray localization is recommended as routine and is described in detail.

Removal of foreign bodies by the posterior route is most often employed, because it permits use of the small electromagnet and affords the most direct line for removal. Substitution of the hand electromagnet for the giant

magnet is strongly urged. The one objection is the fact that an incision through the retina is required unless extraction of the foreign body can be accomplished through the scleral wound of entry. Diathermy of the scleral surface before making the incision is said to minimize the possibility of retinal detachment.

In three hundred cases of probable intraocular foreign body, 50 percent had negative X-ray films and 50 percent positive. Of the 150 positive cases, 50 had successful operations for removal of the foreign bodies. Nonmagnetic foreign bodies caused loss of many eyes. Infection was negligible and no cases of sympathetic ophthalmia were seen. (11 illustrations.)

Edna M. Reynolds.

Somerset, E. J. Self-inflicted conjunctivitis. *Brit. Jour. Ophth.*, 1945, v. 29, April, pp. 196-204.

Two cases of self-inflicted conjunctivitis are reported, and the clinical signs of 31 cases are reviewed. The outstanding points in the diagnosis are summarized as follows: (1) edema of lower half of conjunctival membrane contrasting with normal appearance of upper half of conjunctiva; (2) scanty discharge associated with a necrotic sloughing area of conjunctiva; (3) excessive epiphora; (4) rapid healing. Treatment consists of cleansing with normal saline once or twice a day and the use of a bland ointment to prevent symblepharon. (5 illustrations, references.)

Edna M. Reynolds.

Thornell, W. C., and Williams, H. L. Foreign body involving the floor of the orbit and the antrum. *Arch. of Otolaryng.*, 1944, v. 39, Jan., p. 83.

A girl fell on a small branch which pierced the skin and penetrated

through the floor of the orbit into the antrum. A portion of the foreign body was removed. But there remained a fistulous tract which subsequently had to be reopened and at this time more wood was removed. The case is presented because it illustrates the principle that persistence of a draining fistula following apparent removal of a foreign body is highly indicative that a portion of the foreign material is still present in the region.

Robert N. Shaffer.

Torres Estrada, A. Extraction of intraocular magnetic foreign bodies by means of the small electromagnet. *Bol. de Hosp. Oft. de Nuestra Señora de la Luz*, 1945, v. 3, Jan.-April, pp. 21-26.

It is surprising to find that the author considers a radiologic examination of very slight value, not only for localization of an intraocular foreign body, but also for affirmation of its existence in spite of evidence obtained from examination of the eye. Another surprise is produced by the author's recommendation of the old practice of approaching the magnet to the eyeball in order to discover whether the sensation of pain indicates the presence of a magnetic foreign body within the eye.

W. H. Crisp.

Torres Estrada, Antonio. Ocular lesions caused by emetine. *Bol. del Hosp. Oft. de Ntra. Sra. de la Luz*, 1944, v. 2, Jan.-June, pp. 145-155.

The author has seen several cases of ocular injury by this drug. The first two patients had bathed in water containing chlorine. They went to the druggist for an adrenalin solution to relieve the conjunctival hyperemia which had developed from the chlorine, and by mistake were given ampoules containing hydrochloride of emetine.

The severe irritation which resulted from this mistake was promptly relieved by atropine. In another case the disturbance was caused by a slight spray of the drug from a hypodermic syringe which was being used for injection. In each case the symptoms were slow to develop and there was no conjunctival discharge but much photophobia. After experiments on dogs microscopic study showed thickening of the corneal epithelium, particularly at the limbus; abundant lymphocytic infiltration between the layers of the cornea, as well as in the iris and ciliary body; and abundant formation of vessels in the deep layers of the cornea.

W. H. Crisp.

## 17

### SYSTEMIC DISEASES AND PARASITES

Alagna, C. Experimental studies on relations between the Sanarelli-Schwartzman phenomenon in general and as regards the eye and its adnexa. *Giornale di Med.*, 1944, v. 1, Nov., pp. 163-165.

The author refers to a previous work (*Settimana Medica*, 1942, no. 46, p. 1037) in which, upon the basis of animal experimentation, he concluded that toxic substances originating in an inflammatory focus remote from the eye, and reaching the eye by circulatory channels, might occasionally sensitize certain ocular tissues and produce a special vulnerability, so that under the influence of renewed introduction of the same toxic substance or even of other toxic substances hemorrhagic reactions might develop.

W. H. Crisp.

Dysart, B. R. Modern view of neuralgia referable to Meckel's ganglion.

Arch. of Otolaryng., 1944, v. 40, July, p. 29.

The pain of ulcer of the cornea and in many cases of atypical headache and neuralgia may be relieved by cocaineization of Meckel's ganglion. In some cases the progress of corneal ulcers or other inflammatory corneal lesions is favorably influenced by the same procedure. Cases are cited and the technique of cocaineization outlined. It is thought that the favorable influence is obtained by intercepting nerve impulses and not by attacking a pathologic process in the ganglion.

Robert N. Shaffer.

Gomes, Pereira. Focal infection in ophthalmology. *Arquivos Brasileiros de Oftalmologia*, 1944, v. 7, Dec., pp. 201-208.

The author still regards it as good practice to refuse undertaking an intraocular operation until possible foci of infection have been dealt with. He repeats accounts of examples of focal infection published by himself in previous years. He has found abscesses at the apices of the teeth more frequent when nerves had been destroyed by chemical agents and not by extraction, and is glad to say that the latter process is more usual in Brazil. Other foci of infection must not be overlooked.

W. H. Crisp.

Neame, Humphrey. Observations upon scleritis, keratitis, iritis, and cyclitis in herpes zoster ophthalmicus, with reports of 23 cases and results of histological examinations in two cases. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 239-294.

Of the 23 cases 10 showed macules of the cornea, 2 diffuse keratitis, 3 a disciform type of keratitis, 3 corneal ulcers, 3 superficial punctate keratitis,

5 neuromyolytic changes, 8 scleritis, 8 iritis, and 9 cyclitis. Histopathologic study of two eyes of the series showed round-cell infiltration under the conjunctiva, new fibrous tissue under the irregular epithelium of the cornea, and vascularization of the stroma. In some of the slides nodules of lymphocytes around epithelioid cells were found in the cornea and sclera.

Treatment is unsatisfactory. But ten patients were each given 300 to 450 c.c. of immune serum from a convalescent patient whose attack of herpes zoster had started not more than 18 months previously. The final vision was good in all but one case. Favorable reference is made to Gifford's use of pituitrin for severe pain. For intractable neuralgia, surgical interference and alcohol injections were alike disappointing. The author advises that any patient in whom corneal sensation is reduced or absent be kept under periodic observation, and a contact lens fitted as an alternative to the operation of tarsorrhaphy. (1 table, 30 figures, references.)

Beulah Cushman.

Nettel, Roberto, Jr. *Onchocercosis; biopsy and its clinical interpretation*. *Bol. del Hosp. Oft. de Nuestra Señora de la Luz*, 1945, v. 3, Jan.-April, pp. 1-9. (Reprinted from "*Medicina*," v. 24, year 25, no. 463.) See abstract from same author below.

This article, whose author practices in the State of Chiapas, in the narrow zone of Mexico affected by this disease, deals with the diagnostic study of the microfilarial organism by means of biopsy either of the superficial layers of the skin or of the whole thickness of the skin. Superficial biopsy consists in taking between the thumb and index finger a fold of the previously disinfected skin, and then cutting a thin



layer of some 3 mm. diameter, parallel to the cutaneous surface. The fragment of skin is placed in a drop of physiologic salt solution, on an object glass, and is examined under the low power of the microscope. The section should not be limited to the horny layer of the skin. The microfilarias tend to accumulate in the papillae, although they are sometimes to be found in the stratum granulosum. Some of the microfilarias pass from the fragment of skin into the fluid, others may be seen by transmitted light to lie beneath and some partly adherent to the tissue. It is sometimes advisable to break up the piece of skin with needles and wait some minutes to find the microfilarias. (6 figures, references.)

W. H. Crisp.

Nettel, Roberto, Jr. *Onchocercosis: paths of invasion of the eye.* Bol. del Hosp. Oft. de Nuestra Señora de la Luz, 1945, v. 3, Jan.-April, pp. 10-14. (Reprinted from "Medicina," v. 23, year 24.) See abstract from same author above.

The author belongs to the Organization against Onchocercosis of the Department of Public Health of Mexico. The principal and most frequent route by which microfilarias reach the eye is through the skin of the lids by way of the palpebral conjunctiva. New generations of the organism are developed usually about every two months. Other organisms probably reach the region of the eye by way of filarial nodules deeply situated at the base of the skull. (3 figures.)

W. H. Crisp.

Roveda, J. M. *Ocular myiasis.* Arch. de Oft. de Buenos Aires, 1943, v. 18, Feb., p. 80.

Ocular myiasis is of frequent occurrence in the northern provinces of

Argentina, the largest percentage of the cases being found in young children. The lids become considerably swollen and only upon careful examination can the opening through which the parasite penetrates into the subcutaneous tissue be found. It appears as a round punched-out hole varying from 1 to 2 mm. in size. The parasite, about 15 mm. long, is the larva of the fly *Dermatobia Cyaniventris*. In some cases the larva digs its way into the deep orbital tissues, where secondary infection may give rise to extensive suppuration and ultimate loss of the eyeball. The evolutionary cycle of the parasite is interesting in that the eggs are deposited by the adult fly on the abdominal surface of flies of a different genus, particularly the *Neivamyia lutzi*, which hatch the eggs and become the carriers of the larvae. These drop on the skin or mucous membranes of person of low hygienic habits, and penetrating through a skin pore or mucous membrane quickly lodge in the subcutaneous tissue. Here they occupy a cavity which increases in size with the growth of the parasite, and produce considerable inflammatory reaction in the surrounding tissues. After extraction of the parasite with forceps the inflammation subsides rapidly. Prophylaxis is based on measures of personal hygiene. (Illustrations, bibliography.)

Plinio Montalván.

Sánchez Mosquera, M., and García Márquez, E. *A frequent and little-known syndrome.* Arch. de la Soc. Oft. Hisp-Amer., 1944, v. 4, May-June, pp. 398-407.

The author describes a syndrome of frontal and occipital headache usually experienced on arising in the morning and often associated with lacrimation and photophobia. The angioscotoma is

enlarged. The condition is invariably due to nasal pathology.

J. Wesley McKinney.

Schneider, R. W., Lewis, L., Moses, J., and McCullagh, E. P. Retinal hemorrhage and lens changes in alloxan diabetes in rabbits. *Jour. Lab. and Clin. Med.*, 1945, v. 30, April, p. 364. (See Section 19, Anatomy, embryology, and comparative ophthalmology.)

Scott, J. G. Onchocerciasis. *Amer. Jour. Ophth.*, 1945, v. 28, June, pp. 624-635. (Bibliography.)

Torres Estrada, Antonio. Pathogenesis of punctate keratitis of onchocercosis. *Bol. del Hosp. Oft. de Ntra. Sra. de la Luz*, 1944, v. 2, Jan.-June, pp. 135-145.

The author discusses especially the peculiar condition which may exist in apparently healthy eyes of persons infected with the microfilarias. These organisms may exist in enormous numbers in the various ocular tissues, and very fine lesions may be made out by careful examination with the ophthalmoscope and strong plus lenses, or with the corneal microscope. These lesions furnish a satisfactory explanation of the photophobia and ocular irritability experienced by such patients. Corresponding to these minute lesions, the iris is found to be slightly atrophied, and a peripheral atrophy is found in the pigment epithelium of the retina and choroid. The vitreous also may present a slight dust-like exudate. In the cornea is found the earliest and most constant of the ocular manifestations of the disease, consisting of the development of a punctate keratitis. A remarkable fact is that, as the lesions of the disease pass from the micro-

scopic to the macroscopic phase, the microfilarias gradually diminish in number, and when blindness has developed it is extremely difficult to find even a few parasites in microscopic section. (One illustration.)

W. H. Crisp.

Torres Estrada, Antonio. Tuberculous origin of some general disorders of doubtful etiology, particularly some eye conditions. Their treatment with very dilute solutions of tuberculin and methylic antigen. *Bol. del Hosp. Oft. de Ntra. Sra. de la Luz*, 1944, v. 2, July-Dec., pp. 163-206.

The author calls attention to the striking contrast between the earlier belief in the tuberculous origin of a number of conditions broadly referred to as scrofulous and the later refusal to accept this belief. In the later epoch, it became customary to discard from the picture of tuberculosis all disorders in which the Koch bacillus was not found. The pendulum is now swinging to some extent again in the other direction. In the large clinic of the Hospital de Nuestra Señora de la Luz, at Mexico City, extensive use of the Bezredka test, together with the data of blood biometry, has suggested a greater frequency of the tuberculous than of the syphilitic basis.

Torres Estrada further regards as of considerable value what his essay calls the Vitón method. This consists in administering to patients thought to carry a tuberculous infection one or more injections of infinitesimal doses of tuberculin. If the injection does not cause fever but is followed by improvement in the local lesion and the general condition, with increase of weight, euphoria, and improvement in appetite and sleep, one has a positive Vitón reaction. Torres Estrada, using this

method, found that even the administration of a one-hundred-thousandth of a milligram of tuberculin frequently elicited the Koch reaction, and led to aggravation of the ocular disturbance, whereas in the presence of a positive Vitón reaction the improvement in the disorder was so great and so rapid, and the results at times so nearly miraculous, that they suggested continuation of the use of dilute solutions of tuberculin as specific treatment of the disorder. For a while Torres Estrada reduced the strength of the tuberculin solution to one millionth, and later to the inconceivable quantity of a billionth of a milligram. Even with these extremely weak solutions he has occasionally seen positive Koch reactions. More recently he has arrived at the fantastic dosage of a thousand-billionth of a milligram. By this technique he claims to have cured a tuberculous keratitis, cases of allergic asthma, and allergic skin disturbances. The dose is given every four days. (Many illustrations, tables, graphs.)

W. H. Crisp.

## 18

### HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Berens, Conrad. The making of an ophthalmologist. *Trans. Sec. on Ophth., Amer. Med. Assoc., 1944, 94th mtg., pp. 17-25.* (See *Amer. Jour. Ophth., 1945, v. 28, July, p. 809.*)

Bowman, D. L. Carol's first three years (teaching a deaf-blind child). *Outlook for the Blind, 1945, v. 39, April, p. 91.*

A description of the efforts and sacrifices made by a mother to teach her deaf-blind child during the first three years of its life.

R. Grunfeld.

Caiado de Castro, Plinio. Cost of a campaign of prophylaxis. *Arquivos Brasileiros de Oft., 1944, v. 7, Dec., pp. 208-212.*

The author analyzes the cost in Brazil of a government campaign against trachoma, with special dispensaries, nurses, and physicians. He arrives at the conclusion that the cost is out of proportion to the results obtained.

W. H. Crisp.

Chance, Burton. Johannes Müller. *Trans. Amer. Ophth. Soc., 1944, v. 42, pp. 230-242.* (See *Amer. Jour. Ophth., 1945, v. 28, May, p. 574.*)

Clark, Ivor. Vision problems of military students with heavy academic loads. *Jour. Lancet, 1945, v. 65, Jan., p. 23.*

The eyes of 182 students of Ohio University were studied by the author. The average age was 21 years. All were examined under homatropine cycloplegia, 126 needed help, 90 had myopia. A number of cases with certain predominant symptoms, such as headache, blur, and burning, are discussed briefly and separately. There were four cases of progressive myopia, three with shallow chambers (the type which in later life develops glaucoma). Eight who had never had glasses were badly in need of them. The author feels that cycloplegia should be used for all students entering university life. Francis M. Crage.

Fortner, E. N. Oregon State supervisory program for the visually handicapped. *Outlook for the Blind, 1945, v. 39, Jan., p. 1.*

The state of Oregon has only one state school for the blind and two sight-saving classes in the metropolitan center. Last year a successful

experiment was carried out to help visually handicapped children unable to enroll in these classes. The children attend classes in regular schools. They are given sight-saving materials or books in Braille, as the case may be; also "Talking Book" machine and typewriter; and the state pays a fellow student to read aloud lessons that are not available on Talking-Book records. Students who can't get along under this arrangement are placed in the school for the blind or in sight-saving classes. The State Supervisor supervises their education, visits the schools, and advises teachers concerning special teaching problems. R. Grunfeld.

Fries, E. B. Piano tuning pays dividends. *Outlook for the Blind*, 1945, v. 39, April, p. 1014.

Piano tuning is a lucrative profession suitable to the blind. The advent of radio has intensified the appreciation of music and has stimulated piano playing. R. Grunfeld.

Graue, Enrique, Jr. Biographic sketch of Rafael Silva. *Bol. del Hosp. Oft. de Ntra. Sra. de la Luz*, 1944, v. 2, Jan.-June, pp. 157-160.

The writer speaks from personal knowledge of his recently deceased teacher, prominent ophthalmologist of Mexico City. After graduating in Mexico, Silva studied in Europe under de Lapersonne, Landolt, and Galezowski. He was then accepted as a pupil by Ernst Fuchs, who, however, made him study German for four months before entering the Viennese clinic. (Portrait.) W. H. Crisp.

Pearson, G. H. A review of eye disease in central China. *Brit. Jour. Ophth.*, 1945, v. 29, May, pp. 260-268.

The great bulk of the eye cases

seen at the Methodist Hospital in Shaoyang, Hunan, are of conjunctival infections and their sequelae. Acute conjunctivitis, locally known as "fire eye," in which a bright red color of the scleroconjunctival area is associated with soreness and stickiness of the lids, is very common. It is infectious and large-scale epidemics occur.

Trachoma is one of China's most pressing public-health problems. Every fourth person is infected. The author suspects every case of chronic conjunctivitis of being trachoma. Six different types of trachoma are listed and described: (1) early cases in which there is only rudimentary follicle formation and no pannus; (2) fully developed trachoma with many soft lymphoid follicles and well-developed pannus; (3) cicatricial cases where the follicles have mostly disappeared and where scar tissue takes their place (at this stage, pannus frequently covers the entire cornea); (4) "the hard type of trachoma" where the fibrous tissue instead of being smooth takes on a hard, nodular condition, resembling a tessellated pavement; (5) cases with plasmoma formation, in which a friable tumor mass lies below the epithelium of the conjunctiva (not encapsulated, can be scraped out with a sharp spoon but often with serious scarring and loss of conjunctiva); (6) pterygium as a late complication of trachoma.

Expression of the follicles is usually done in the out-patient department with the finger nails or two ordinary scalpel handles. Anesthesia is hardly ever used. The author considers the use of sulfanilamide by mouth irrational. He uses sulfanilamide powder locally. In the "hard type cases" any treatment except excision of the whole area is useless. Entropion is treated

almost uniformly by the Hotz operation.

Pterygium almost universally occurs in old chronic trachoma patients. Its development often begins as a marginal ulcer which progresses toward the center of the cornea.

Gonorrheal infection is very common and ophthalmia neonatorum extremely prevalent. Measles is very common and is often followed by massive ulceration of the cornea and by keratomalacia. Smallpox pustules on the cornea are frequently seen. Acute cerebrospinal meningitis is frequent and is a common cause of blindness. Sympathetic ophthalmia is frequent because of neglected perforating wounds of the eye.

Edna M. Reynolds.

Pollock, W. B. I. The antiquity of ophthalmology. *Brit. Jour. Ophth.*, 1945, v. 29, May, pp. 252-259.

Ophthalmology is shown to be the first specialty. It existed as a specialty in Egypt more than 3,000 years B. C., and also in Mesopotamia between 2,000 and 1,500 B. C.

The medical papyri are listed and their contents are reviewed. It is suggested that the Egyptians may have used a mold similar to penicillin in the treatment of disease.

Edna M. Reynolds.

Schoenberg, M. J. A report on the progress of the glaucoma campaign during the past three years. *New York State Jour. Med.*, 1945, v. 45, April 1, p. 738. (See Section 8, Glaucoma and ocular tension.)

Scott, J. G. Trachoma in West African Negroes. *Brit. Jour. Ophth.*, 1945, v. 29, May, pp. 244-252.

Trachoma in the West Coast African

Negro is a mild disease, of the general infiltrative type. In Gambia, it affects 5 percent of the school children, 10 percent of the soldiers, and 25 percent of the population in some villages. In Nigeria and on the Gold Coast, 10 percent of the soldiers showed the presence of trachoma. Only 2 percent of the Cameroon soldiers were affected. Three hundred American Negro soldiers had no similar infection but were not immune. (References.)

Edna M. Reynolds.

Sená, J. A. Industrial lesions of the eye under the Argentine law. *Arquivos Brasileiros de Oft.*, 1944, v. 7, Dec., pp. 213-232.

The subject is reviewed in considerable detail, with an abundance of statistical material. Reference is made to a large number of occupational disorders, and also to the relation between accidents and a number of systemic and local conditions including trachoma, tumors of the eye, syphilis, tuberculosis, exophthalmic goiter, and neuroses and psychoses.

W. H. Crisp.

Somerville-Large, L. B. Dublin eye hospitals. *Irish Jour. Med. Science*, 1944, 6th series, Sept., p. 485, and Oct., p. 534.

The author reviews the development of the eye hospitals in Dublin from a historical point of view. He points out that this reflects the general advance in clinical medicine. The first Dublin eye hospital was the National Eye Hospital founded in 1814, at which time there were two ophthalmic hospitals in London and three in the provinces. The other institutions dealt with are Ophthalmic Hospital, 1829-1834; Coombe Lying-In Hospital and Dublin Ophthalmic Dispensary, 1836-

1847; St. Mark's Ophthalmic Hospital for Diseases of the Eye and Ear, 1841-1904; Dublin Infirmary for Diseases of the Eye and Ear, 1872-1875; and the Royal Victoria Eye and Ear Hospital, formed by combination of the National Eye and Ear Infirmary, founded in 1815, and St. Mark's Ophthalmic Hospital, founded in 1844. Brief descriptions are given of the leading clinicians of the time and their relation to the various hospitals.

Owen C. Dickson.

Streltsov, V. The function of the eye in aviation. *Amer. Rev. Soviet Med.*, 1944, v. 2, Dec., p. 126.

Acute visual disturbances, "black-out" or "red-out," have been encountered by pilots either while making high velocity turns or while taking a plane out of a dive. When the gravitational force is directed caudad, the retina becomes anemic and black-out results. When the gravitational force is directed cephalad, engorgement of the retinal and choroidal vessels occurs and red vision or red-out is caused.

The glare of searchlights obscures the vision of the dark-adapted eye of the pilot for a considerable length of time and he may miss important signal lights or lights from airplanes. Dark glasses worn in daytime for several days before nocturnal maneuvers increase the sensitivity of the eye to light.

Anoxia at a height of 4,000 to 5,000 meters causes diminution of visual acuity to one-fourth of normal. It can be improved by taking benzedrine in doses of 20 mg., or 200 to 300 mg. of ascorbic acid, or 100 mg. of a synthetic preparation known as 8-methyl caffeine prior to high altitude flying.

At 5,500 to 6,000 meters color perception becomes very difficult. Accom-

modation, which is intimately connected with judgment of distance, is markedly impaired by anoxia. Decrease in color and light perception is accompanied by loss of depth perception, furthermore the threshold of time required for judgment of depth is raised. The pilot, therefore, is compelled to circle over the airdrome several times before landing.

Most of these impaired functions occurring in high altitude flying are fully restored by intake of oxygen:

R. Grunfeld.

Vail, D. T. Ophthalmic education. *Trans. Ophth. Soc. United Kingdom*, 1943, v. 63, pp. 218-223.

The author reviews the history of ophthalmic education in the United States. The American Academy of Ophthalmology and Otolaryngology, the American Board of Ophthalmology, and the development of ophthalmic residencies have been the chief influences for the advancement of ophthalmic education. The Academy provides refresher courses and guides according to the requests of its members. For five days a year its members have the opportunity of instruction from experts in parts of the field. Twenty lectures may be going on at the same hour and the member must make his choice. The topics chosen range from a review of glaucoma to a continuous course in advanced slitlamp microscopy or pathology of the eye. Beside the instructional programs the usual scientific program of six to eight papers is presented to the entire membership. There are also scientific and commercial exhibits and a teachers' section. The Academy also provides a monthly home study course for hospital internes and residents and others who are unable to follow a basic study

course. It also provides funds for special research work.

The American Board of Ophthalmology was organized in 1916. Its purpose has been: (1) to elevate the standards of ophthalmology; (2) to determine the competence of practitioners professing to be specialists; (3) to arrange and conduct examinations to test the qualifications of candidates who appear before the Board for certificates of qualification as specialists in the field of ophthalmology, (4) to issue certificates to candidates successful in demonstrating their proficiency; (5) to act as advisers to prospective students of ophthalmology; (6) to serve the public, hospitals, and medical schools by preparing lists of specialists certificated by the Board. 2,142 ophthalmologists have received the certificate of the Board. Many societies require the certificate as a prerequisite for memberships and many hospitals require the certificate for appointment or promotion.

Beulah Cushman.

Walkingshaw, R. *Ophthalmology in Lagos*, 1943. *Brit. Jour. Ophth.*, 1945, v. 29, May, pp. 221-224.

A report of 3,205 cases seen in the Eye Clinic of the African Hospital in Lagos, Nigeria, is given. In 452 cases of conjunctivitis only a very few instances of Morax-Axenfeld or Koch-Weeks infection were found. Spring catarrh was found affecting the lids in only two cases. The remainder were of the limbal type. The number of trachoma cases was sufficient to warrant a special session of the clinic. The majority of the trachoma patients showed exacerbations of the acute stage. Many had pannus covering most of the cornea and extreme degrees of entropion were quite common.

Pterygium is extremely common in Lagos.

Many types of keratitis were seen in the clinic but there was not a single case of syphilitic interstitial keratitis in spite of the high incidence of venereal infections reported among the general out-patients of the hospital. Most corneal ulcers were of the simple staphylococcal type. Limbal ulcer was fairly common, but there were only two cases of dendritic ulcer and both of these were in European patients.

Iritis was not common, and the author's impression was that posterior synechiae are not nearly so common as in European countries. Cyclitis was found to be the principal affection of the uveal tract. Fine deposits were frequently found on the posterior lens surface in routine ophthalmic examinations, and in some cases the exudate had formed a complete cyclitic membrane.

A striking proportion of unilateral cataracts were seen in patients aged 30 years and upward. They had the appearance of simple senile cataract, and seemed closely related to dietary deficiency. Very few were sufficiently advanced to warrant operation. Not a single case of diabetic or nephritic retinitis was found, and there was no case of optic neuritis or papilledema. Optic atrophy was extremely common, the great majority of the cases being due to avitaminosis. Only one case of acute congestive glaucoma in an African was discovered, but chronic glaucoma is a common complaint. Since there is little industry in the country, the foreign bodies were all of a comparatively simple nature. The incidence of strabismus is certainly much lower among the general population than in Europe. Only one case presented itself

at the clinic in over 3,000 patients. (3 tables, references.)

Edna M. Reynolds.

Weld, S. B. Old Farms Convalescent Hospital for the blind soldier. Connecticut State Med. Jour., 1944, v. 8, Dec., p. 875.

The hospital has a capacity of two hundred beds and has now an enrollment of about fifty men. It has on its staff a psychologist and three counselors with years of experience in placing men in jobs for which they show adaptability. The usual stay in hospital is four months but many remain longer. The soldier is taught to become familiar with machines, such as the drill, press, and lathe. He learns rug weaving, toy making, plaster modeling, gardening, poultry raising, printing, and book binding. Later he is placed in an industrial plant in a nearby city. He is taken there in the morning, works all day alongside a man with sight in both eyes, and is brought back in the evening. R. Grunfeld.

## 19

### ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Drager, G. A., and Baker, C. A. An anatomical investigation of the retino-pituitary reflex. Texas Reports on Biol. and Med., 1944, v. 2, Winter, p. 401.

Three weeks after enucleating one eye from adult pigeons, microscopic examinations were made of the severed optic nerve and the various structures related to the optic system.

Since no degenerated fibers could be traced from the optic tract to the hypophysis, direct connection between the optic nerve and the pituitary gland,

in the form of an unmyelinated optico-posterior pituitary nerve pathway, still remains a possibility.

Francis M. Crage.

Herrmann, H., and Moses, S. G. The cytochrome oxidase activity of the lens of bovine eyes. Jour. Biol. Chem., 1945, v. 158, March, p. 47.

The addition of cytochrome to preparations from the lens cortex greatly accelerates the oxidation of hydroquinone, suggesting the presence of cytochrome oxidase in the cortex.

R. Grunfeld.

Hess, W. N. Visual organs of invertebrate animals. Scientific monthly, 1943, v. 57, Dec., p. 489.

The author states that, while accommodation is generally attributed only to invertebrate animals, there is some evidence that in certain higher mollusks, such as the squid, contraction of the iris sphincter increases the pressure on the vitreous humor, and so causes the lens to be pushed forward, changing the focus of the eye.

Francis M. Crage.

Robbins, B. H. Dinitrophenol cataract in the chick; effect of age. Jour. Pharm. and Exper. Therapeutics, 1944, v. 82, Nov., p. 301.

Ingestion of food containing 0.25 percent dinitrophenol sodium, by 15 chicks varying in age from 65 to 300 days, led to development of lens opacities in 14 of them. In one chick, 300 days old, the lens remained clear.

Francis M. Crage.

Schneider, R. W., Lewis, L., Moses, J., and McCullagh, E. P. Retinal hemorrhage and lens changes in alloxan



diabetes in rabbits. *Jour. Lab. and Clin. Med.*, 1945, v. 30, April, p. 364.

Retinal hemorrhages did not develop in rabbits made diabetic with one or two large injections of alloxan, as long as they maintained the normal level of plasma proteins. If, however, the animals showed a reduction in total protein and plasma albumin, retinal hemorrhage developed within one to three months. After experimental re-

duction in plasma albumin and subsequent administration of alloxan, retinal hemorrhage appeared in from five to seven days. It appeared in one animal in spite of insulin and polyvitamin therapy.

Peripheral lens vacuoles were observed in all animals. The lens changes progressed in direct proportion to the duration of the diabetes.

R. Grunfeld.

## NEWS ITEMS

Edited by DR. DONALD J. LYLE  
904 Carew Tower, Cincinnati 2

News items should reach the editor by the twelfth of the month.

### DEATHS

Dr. Nathan L. Bourne, Decatur, Illinois, died May 17, 1945, aged 71 years.

Dr. Joseph W. Chetwynd, East Liverpool, Ohio, died May 2, 1945, aged 63 years.

Dr. Alfred E. Ewing, McDonald, Ohio, died May 23, 1945, aged 75 years.

Dr. Thurman B. Haas, McArthur, Ohio, died March 15, 1945, aged 58 years.

Dr. G. L. Hoffman, Sr., Norristown, Pennsylvania, died May 17, 1945, aged 77 years.

Dr. George L. Lewis, San Angelo, Texas, died April 5, 1945, aged 63 years.

Dr. George F. Seiberling, Allentown, Pennsylvania, died May 6, 1945, aged 75 years.

Dr. John W. Swindell, Greenville, Texas, died April 20, 1945, aged 75 years.

Dr. Marcus Thrane, Hood River, Oregon, died April 10, 1945, aged 70 years.

### MISCELLANEOUS

The American Board of Ophthalmology wishes to make the following announcement: Due to transportation difficulties, the examination of the Board, originally scheduled for Chicago, October, 1945, has been postponed to January 18th through 22d inclusive, 1946. 1946 examinations: Chicago—January 18th through 22d; Los Angeles—January 28th through February 1st; New York—May or June; Chicago—October.

Washington University is offering an eight-months' postgraduate basic course in Ophthalmology, beginning October 1, 1945, to qualified physicians; fee \$600. Anyone interested should address the Registrar, Washington University School of Medicine, Saint Louis 10, Missouri, or Dr. Lawrence T. Post, 640 South Kingshighway, Saint Louis 10, Missouri.

### SOCIETIES

At the annual meeting of the Buffalo Ophthalmologic Club the following officers were elected for the 1945-1946 season: Dr. William

H. Howard, president; Dr. Dante J. Morgana, vice-president; and Dr. Sheldon B. Freeman, secretary-treasurer. Meetings are held on the second Thursday of each month from October to May.

### PERSONALS

Dr. Edward J. Curran, Kansas City, retired as professor of ophthalmology and head of the department at the University of Kansas School of Medicine, Kansas City, Kansas. He has been succeeded by Dr. John A. Billingsley, Kansas City, Kansas.

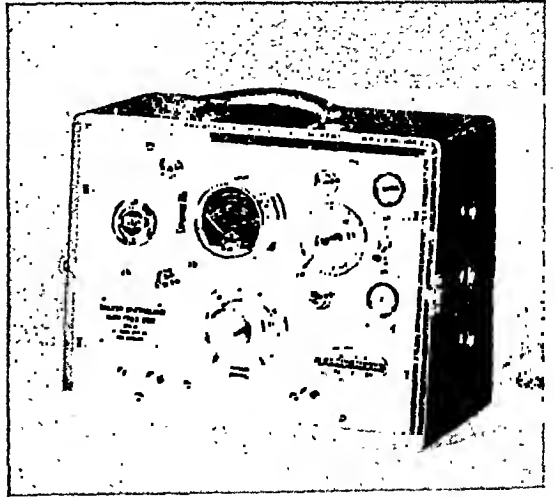
The Leslie Dana Gold Medal will be presented this year to Dr. William Zentmayer, professor emeritus of diseases of the eye; Graduate School of Medicine, University of Pennsylvania. Dr. Zentmayer was selected for this honor by the St. Louis Society for the Blind, upon the recommendation of the Association for Research in Ophthalmology. Dr. Zentmayer is a member of numerous medical, public health, and other scientific organizations. The conditions of the Leslie Dana Gold Medal award set forth that it is to be made for "long meritorious service in the conservation of vision in the prevention and cure of diseases dangerous to eyesight; research and instruction in ophthalmology and allied subjects; social service for the control of eye diseases; and special discoveries in the domain of general science or medicine of exceptional importance in conservation of vision."

Col. Derrick T. Vail (MC) has been released from the Army but is retained as Civilian Consultant in Ophthalmology to the Surgeon General. He is replaced by Major Trygve Gundersen as Chief, Ophthalmology Branch, Surgical Consultants Division Office Surgeon General. Lt. Col. James N. Greear has returned from the European Theatre of Operations and is in the process of being released from the Army.

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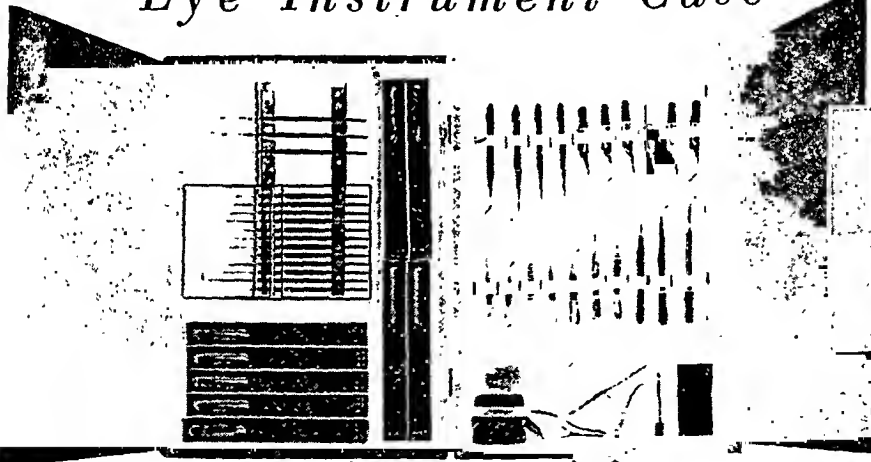
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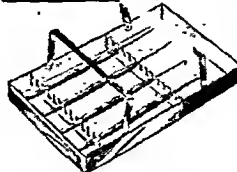
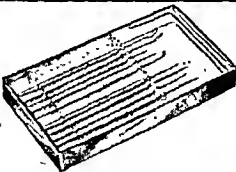
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# AMERICAN JOURNAL OF OPHTHALMOLOGY

SERIES 3 • VOLUME 28 • NUMBER 10 • OCTOBER 1945

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## ACQUIRED BLEPHAROPTOSIS\*

(SYMPTOMATIC PTOSIS)

EDMUND B. SPAETH, M.D.

*Philadelphia*

On two occasions before it has been my privilege to present to this College, discussions on congenital ptosis. The first of these, in 1937,<sup>1</sup> was a discussion of the surgical correction upon anatomic principles. The second, in 1943,<sup>2</sup> was a classification of congenital ptosis and was based upon the analysis of a series of consecutive cases of congenital ptosis.

Since the publication of this classification, additional cases have appeared which tended to raise the incidence of some of these classes—that is, those of the complicated cases—at the expense of another, but in general, the differences are not significant.

Acquired ptosis is of interest not so much in the number of cases seen, as in the various etiologic factors that cause it. A table of percentages of etiologic incidence, has, however, relatively little value compared to the etiologic factors. One observer, associated with a large neurologic and neurosurgical service, would find an unusually high incidence in such cases; another, an ophthalmologist with a large practice in industrial ophthalmology, would find that trauma predominated as a cause; a third, closely associated with an extensive endocrinologic service, would

find a disproportionate incidence in myasthenia gravis and in the thyrotoxic forms of acquired ptosis. For this reason, no attempt is to be made to give the percentage incidences of the various forms in this analysis of somewhat less than 250 cases. It is sufficient to call attention to its relative frequency, and its many possible causes. While the condition is essentially a symptom from other pathologic situations, it needs correction, frequently separate from that necessary for the basic cause of the ptosis. Symptomatic ptosis is a better term than acquired, it is more descriptive.

Cases appear repeatedly which simulate to a marked degree congenital ptosis. The history of the patient's disease should be sufficient to arrive at an estimate of the etiology, if not by affirmation at least by the elimination of various probable factors. This applies especially to central (nuclear) and brain-stem pathologic change, for in these conditions a remarkable similarity to true congenital ptosis frequently appears. The combination of a superior rectus with a levator palsy, as a single pathologic finding, would make diagnosis difficult without an accurate history.

With but few exceptions this classification is based upon cases seen at The Graduate Hospital, The Wills Eye Hospital, The Philadelphia Hospital for the Insane, and as private patients through the office.

\* From the Graduate Hospital, The University of Pennsylvania, Graduate School of Medicine, and The Wills Eye Hospital. Presented before the Section of Ophthalmology, The Philadelphia College of Physicians, on January 18, 1945.

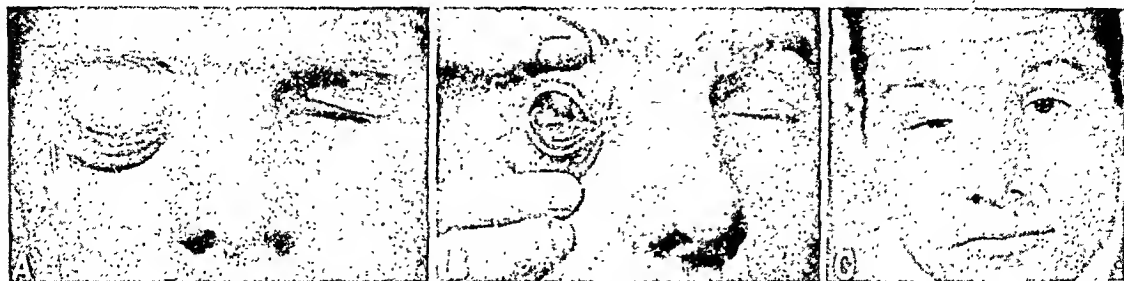


Fig. 1 (Spaeth). A and B, complete avulsion of the levator, traumatic; and C, the end result following surgery.



Fig. 2 (Spaeth). A, partial sectioning of the levator. B, following surgical reattachment.

The principal causes for acquired ptosis are: posttraumatic conditions, neuromuscular situations, and complications of neurologic and/or neurosurgical con-

ditions. Some of the subdivisions to be given intermesh, necessarily so, in that the classification is based upon etiologic as well as anatomic situations.

#### CLASS 1. TRAUMATIC PERIPHERAL

A. Peripheral, as one would see with a complete (fig. 1), or an incomplete (fig. 2), sectioning of the levator; hence the inability to elevate the lid.

B. Peripheral and Cicatricial, in which the muscle itself is uninvolved, but scar formation prevents normal amplitude of movement, scar tissue either in the skin (fig. 3), or in the cul-de-sac (fig. 4), or in both (fig. 5).

C. Peripheral and Cicatricial, from conjunctival and muscle involvement as with a trachomatous symblepharon (fig. 6), or as the result of chemical or hot-

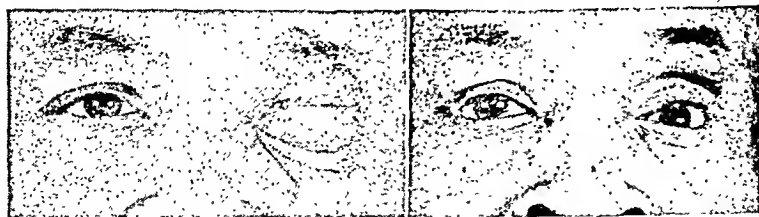


Fig. 3 (Spaeth). Ptosis before and after scar resection.



Fig. 4 (Spaeth). A traumatic case wherein resuturing of the levator was combined with the removal of a scar adherent to the bone, and an enucleation due to a fracture of the orbit. The middle photograph shows the marked enophthalmos with the globe lying in the ethmoidal sinus. The third picture of this series is the end result.

metal burns, wherein the symblepharon lies largely in the superior fornix (fig. 7).

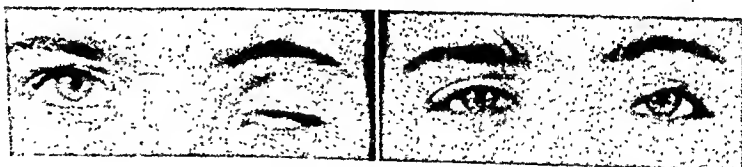
D. Peripheral, resulting from the destruction of bone tissue as in osteomyelitis (fig. 8), or from loss of soft tissues of the upper lid, or a combination of the two (figs. 9 and 10). This should also include the ptosis following blepharoplasties (figs. 11 and 12). The surgery of a superior- or supraorbital-route orbitotomy, even with the best surgical manipulations may be followed either by the development of ptosis (fig. 13), or the exaggeration of a ptosis previously present (fig. 14), but to a lesser degree.

E. The ptosis which appears, at times, after reconstruction of a socket. It is probable that a large number of these cases are due to a more or less complete destruction of the levator as the result of the reconstructive surgery. It emphasizes the importance of not injuring the levator in the superior cul-de-sac during a socket reconstruction (figs. 15 and 16).

## CLASS 2. TRAUMATIC, CENTRAL AND CEREBROSPINAL

These are essentially the result of a third-nerve paresis or paralysis; or of a

Fig. 8 (Spaeth). Ptosis following osteomyelitis, also after its surgical correction.



cervical sympathetic paralysis through vascular pathologic change; or of sectioning of the nerve, and will be considered later, herein.

## CLASS 3. PERIPHERAL, INFLAMMATORY OR NEOPLASTIC, THE RESULT OF INTRAORBITAL PATHOLOGIC CHANGE

Many of these cases have, as an accompaniment, unilateral exophthalmos



Fig. 5 (Spaeth). A rather similar situation wherein chronic scarring, lid and cul-de-sac, has occurred from a subacute to chronic tuberculous osteomyelitis.



Fig. 6 (Spaeth). Ptosis with trachoma. The deformity of the tarsal plates is especially evident.



Fig. 7 (Spaeth). Ptosis with superior-fornix chemical-burn symblepharon.



Fig. 9 (Spaeth). The ptosis of a complete upper-lid reconstruction.





Fig. 10 (Spaeth). The ptosis following osteomyelitis of a formerly present, chronic, suppurating frontal sinusitis.



Fig. 13 (Spaeth). Residual ptosis following orbitotomy for a retrobulbar cyst (patient of Dr. Warren Reese).



Fig. 11 (Spaeth). Ptosis following blepharoplasty.

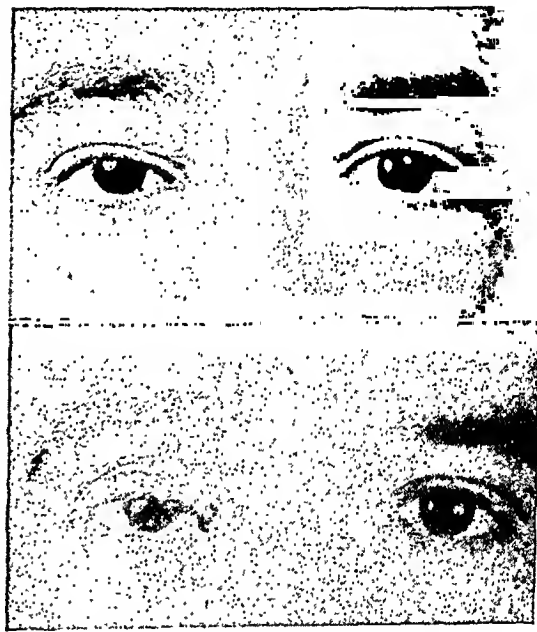


Fig. 14 (Spaeth). Cicatricial ptosis following the removal of a dermoid from the lateral wall of the orbit.

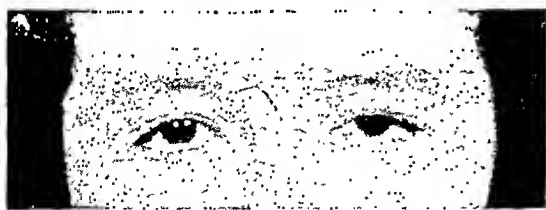


Fig. 12 (Spaeth). End result in this case.

with a displacement of the globe in various directions. Figure 17, A and B, depict a long-standing ptosis from retrobulbar wooden foreign bodies which had been in the orbit for almost one year; figure 18 the ptosis of a retrobulbar pseudotumor; figure 19 the ptosis of a retrobulbar neuroma before and after the

orbitotomy. Figure 20 shows the ptosis of a neurofibroma of the lids; figure 21, the ptosis before and immediately after surgery for a mucocele of the frontal sinus; figure 22 the ptosis of an orbital sarcoma; figure 23 the ptosis of an orbital hemangioma. Figure 24 illustrates a tremendous degree of ptosis from a carcinoma which arose in the maxillary antrum and extended into the orbit; figure 25 the ptosis of a very possible gumma of the orbit. (This diagnosis was neither histologically nor therapeutically confirmed in that the patient left Wills Hospital before this was done. She did have, however, the

Fig. 15 (Spaeth). Ptosis of socket reconstruction.



Fig. 16 (Spaeth). Post-socket reconstruction ptosis wherein failures in previous surgery augmented the post-surgical ptosis.



Fig. 17 (Spaeth). A, foreign bodies, pieces of a wooden bat (very slightly magnified photographically), removed from the orbit. B and C show the ptosis induced by these retrobulbar foreign bodies—before and after removal.



Fig. 18 (Spaeth). The chronic inflammatory ptosis of retrobulbar pseudotumor, chronic phlegmon.



Fig. 19 (Spaeth). The ptosis of retrobulbar neuroma before and after surgical removal. Enucleation was necessary in this case.

serologic indications and the subjective symptoms of an orbital gumma.) Figure 26 presents the ptosis with a pachydermatocele of a profound degree of neurofibromatosis of the orbit.

#### CLASS 4. ATONIC PTOSIS

This is the ptosis of senility, of blepharochalasis, and should also include the

essentially atonic ptosis which one sees occasionally after old simple enucleations, wherein there had been no Tenon's capsule implant. In these cases there is usually a large, dry, atrophic socket with a flabby, relaxed upper lid. Figure 27 shows such a form of ptosis. Figure 28 is an example of the ptosis of blepharochalasis.



Fig. 20 (Spaeth). The ptosis of neurofibromatosis of the lid.

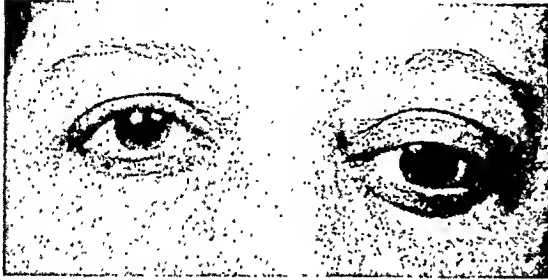


Fig. 22. (Spaeth). The ptosis and exophthalmos of retrobulbar sarcoma (patient of Dr. A. Howland).



Fig. 24 (Spaeth). High degree of ptosis of an extending carcinoma from a maxillary sinus (patient of Dr. James S. Shipman).

#### CLASS 5. NEUROMUSCULAR DISTURBANCES

This form of ptosis is best illustrated by that seen after the physiologic administration of curare, for it exemplifies the basic pathologic situation. Myasthenia



Fig. 21 (Spaeth). The ptosis of a mucocele of the frontal sinus before and immediately after its surgical extirpation.



Fig. 23 (Spaeth). The ptosis of retrobulbar hemangioma.

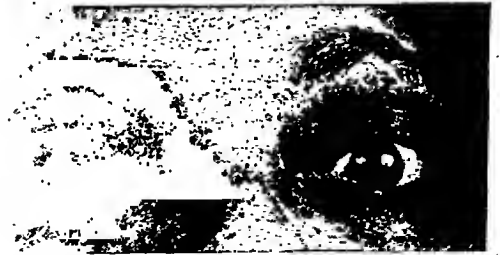


Fig. 25 (Spaeth). The ptosis of a probable retrobulbar gumma (patient of Dr. I. S. Tassman).

gravis is the characteristic pathologic condition (fig. 29). The myasthenia of a thymic tumor is somewhat similar. The myasthenia that occurs in association with the ophthalmoplegias of thyrotoxicosis is

a third example (fig. 30). These three forms of ptosis are to be considered as a symptom rather than the disease itself. All three of them are not uncommonly associated with a paralysis of the superior

31 illustrates this very well. It is an ophthalmoplegia associated with thyrotoxic exophthalmos, with a paralysis of the superior rectus outstanding, and with lid retraction. Figures 30 and 31 should be

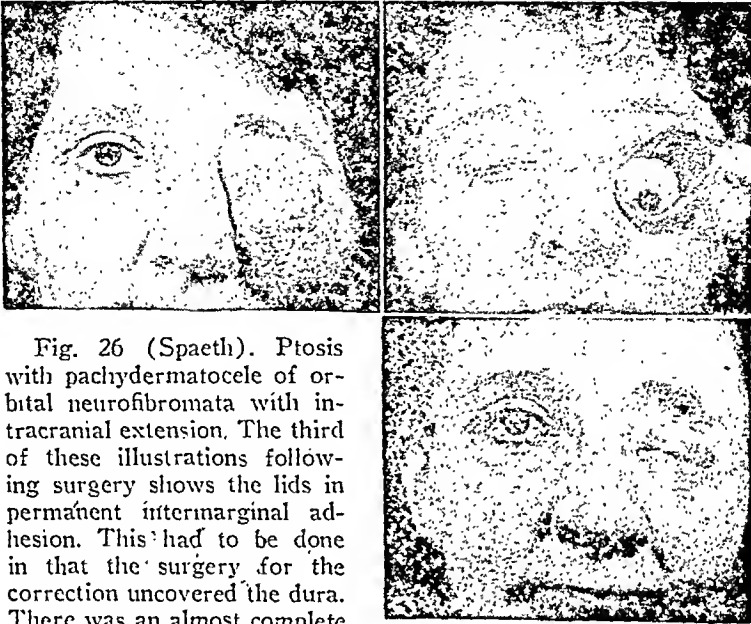


Fig. 26 (Spaeth). Ptosis with pachydermatocele of orbital neurofibromata with intracranial extension. The third of these illustrations following surgery shows the lids in permanent intermarginal adhesion. This had to be done in that the surgery for the correction uncovered the dura. There was an almost complete destruction of the orbital roof. These permanent intermarginal adhesions were arranged in this manner to protect the dura from the extension of subsequent incidental infection (patient of Dr. J. S. Shipman).



Fig. 27 (Spaeth). The ptosis of an old, neglected enucleation before and after the surgical correction.

rectus as well. The exophthalmos and the ophthalmoplegias of the thyrotoxic disturbances are both secondary to the muscle changes, and the two, basic etiology and the result, are otherwise not related to each other. In addition, in thyrotoxic disturbances upward movements are frequently affected at first, and these are more commonly associated with lid retraction rather than with ptosis. Figure

compared, one with the other. The differentiation between these three forms of myasthenia is interesting. The ptosis of curare responds to prostigmine, as does the ptosis of myasthenia gravis, especially when this is accompanied by some mild physical exertion. The ptosis of a thymic tumor is cured by the removal of the offending gland. The ptosis of thyrotoxic myasthenia does not respond to prostig-



Fig. 28 (Spaeth). The ptosis of blepharochalasis.



Fig. 29 (Spaeth). Ptosis of myasthenia gravis; involving the upper lid and the levator.



Fig. 30 (Spaeth). The ptosis of thyrotoxicosis subsequently corrected as in B following thyroidectomy and after a bilateral subzygomatic decompression for the exophthalmos.

mine and is associated with an elevated basal metabolic rate, with other general symptoms of toxicity.

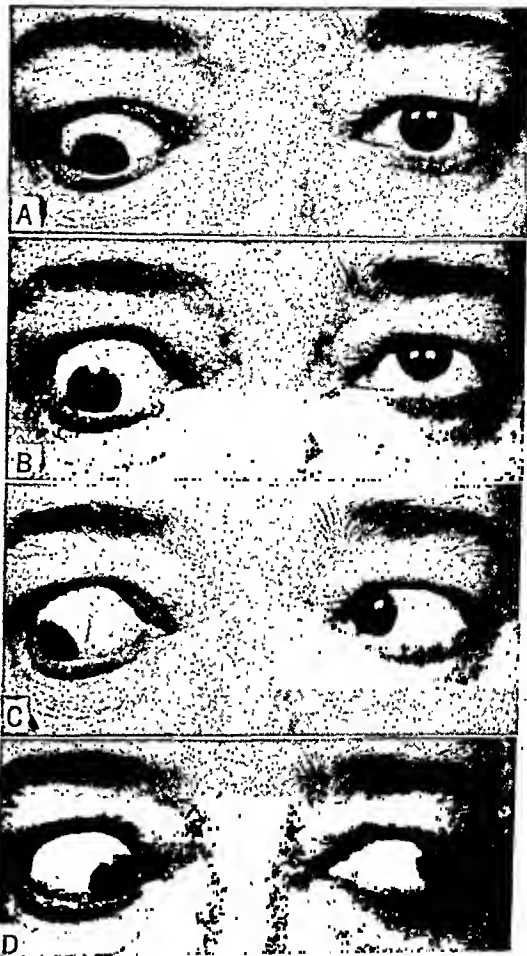


Fig. 31 (Spaeth). Ophthalmoplegia with lid retraction of thyrotoxic exophthalmos (patient of Dr. J. S. Shipman).

#### CLASS 6. THE PTOSIS OF CERVICAL SYMPATHETIC INVOLVEMENT

This degree of ptosis is never so profound as is the ptosis of third-nerve levator involvement; the lid fold is usually intact. The commonest example of this is the classical ptosis present in Horner's syndrome. Figure 32 is a copy of Bing's famous original photograph as he presented it. Figure 33 shows the ptosis of a bilateral cervical sympathetic paraly-

sis. Both of these illustrate rather well the maintained orbital-palpebral fold characteristic of this type of ptosis. Figures 32 and 33 also show the miosis of this condition.



Fig. 32 (Spaeth). Sympathetic Horner's pupillary syndrome, associated with Klumpke's paralysis. From Bing's "Regional diagnosis." Ed. 11, Saint Louis, C. V. Mosby Co., 1943.

#### CLASS 7. THE PTOSIS OF THIRD-NERVE INVOLVEMENT

A. Peripheral extracranial. Figure 34 depicts a complete third-nerve palsy, permanent, internal as well as external, consequent upon the unintentional retention of a packing following the exenteration of the ethmoidal sinus. Figure 35 illustrates a ptosis with a simultaneous superior-rectus involvement; that is, both branches of the upper division of



Fig. 33 (Spaeth). Bilateral cervical sympathetic paralysis.

the third nerve were affected following a blow to the orbit. During the acute phase some exophthalmos was present. It is quite likely, therefore, that the condition was vascular in nature. Figure 36 presents a ptosis, with a sixth-nerve palsy,



Fig. 34 (Spaeth). Permanent ptosis, complete third-nerve paralysis following the retention of intrasinus packing following an ethmoidal sinu-tomy.



Fig. 35 (Spaeth). Ptosis with paralysis of the superior rectus following a blow to the orbit.





Fig. 36 (Spaeth). Ptosis with paralysis of the external rectus following a stab wound of the orbit.

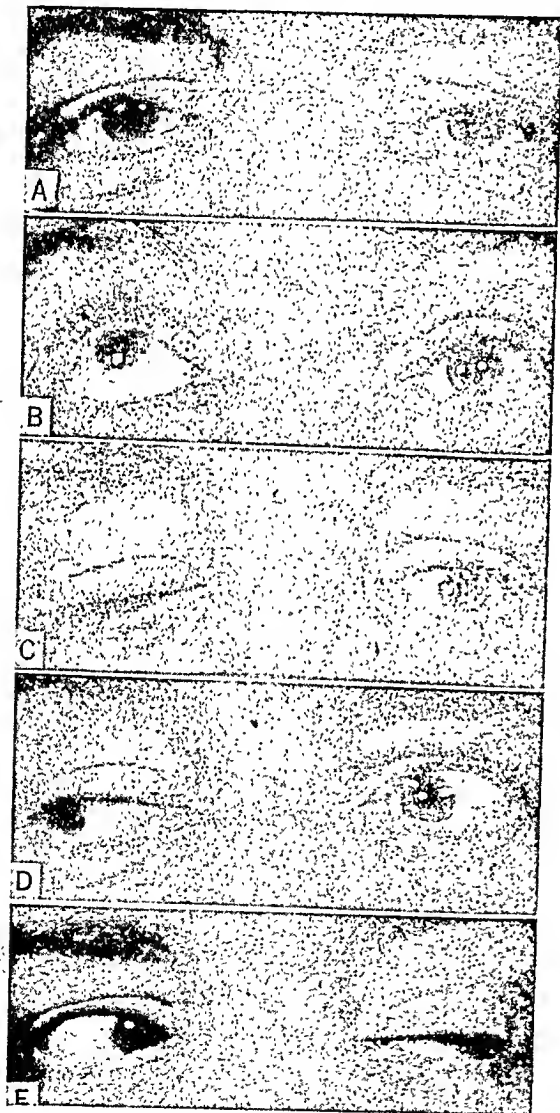


Fig. 37 (Spaeth). The ptosis of the pseudo-Graefe syndrome. O.S., involved eye: A, gaze to the front; B, upward gaze; C, downward gaze without ptosis; D, gaze to right and absence of ptosis; E, gaze to left with greatest degree of ptosis.

from a stab wound of the orbit. Similar situations are seen following gunshot wounds of the orbit and fractures through the medial superior and lateral walls of the orbit.

B. Infranuclear, but intracranial. This is the type of case usually encountered following injury; and is most commonly responsible for the pseudo-Graefe syndrome. Figure 37 depicts such an instance. The same type of ptosis is seen with perichiasmal pathologic change, with an aneurysm of the circle of Willis, and



Fig. 38 (Spaeth). Permanent ptosis following recovery from an interpeduncular hemorrhage. The case was preceded by a classical hemiplegia alternans superioris.

is a part of the temporary to permanent ptosis of hemiplegia alternans superioris from interpeduncular vascular pathologic change. The condition is essentially an incomplete third-nerve paralysis. Figure 38 illustrates such a situation. The temporary preoperative and not uncommon postoperative ptosis of intracranial neoplasms also falls into this class. Figure 39 shows permanent ptosis following a right-sided, temporal-lobe glioma (posterior portion), in which there was an almost complete permanent third-nerve palsy following recovery from the craniotomy. These infranuclear forms of ptosis may be either temporary or permanent, depending wholly upon the etiologic factor. Figure 40 presents a condition which should also be included in this subdivision in that it is a case of complete



Fig. 39 (Spaeth). The permanent ptosis of an almost complete third-nerve palsy following a craniotomy for temporal-lobe glioma.

ptosis from cerebrospinal syphilis. One is not certain, however, whether this type of case should not be included with the third-nerve, nuclear, involvement instead.

C. Third-nerve ptosis from nuclear and intranuclear involvements. A complete third-nerve paralysis is, of necessity, rare, because of the extent of cortical substance that must be damaged to bring about such a condition. Incomplete nuclear conditions are more common. Figure 40, included under infranuclear cases, illustrates a syphilitic manifestation. Inflammatory, vascular, and degenerative



Fig. 40 (Spaeth). The ptosis of acquired syphilis.

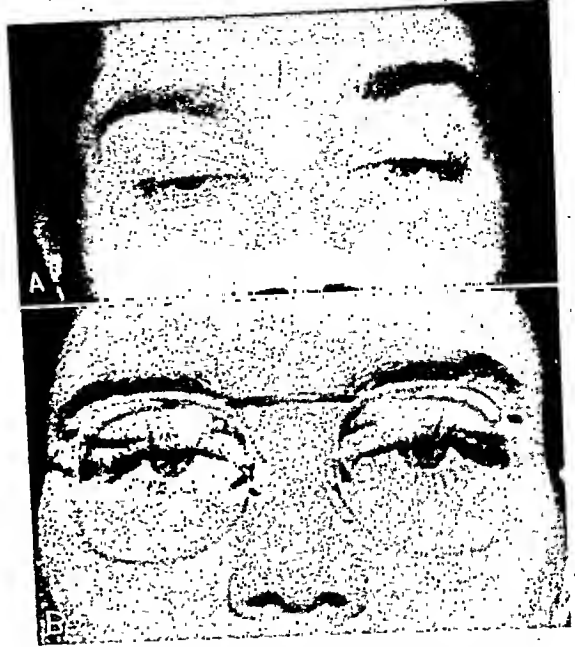


Fig. 41 (Spaeth). A, case of steadily progressing bilateral internal and external ophthalmoplegia, that type of case frequently spoken of as Graefe's disease. B, with crutch glasses worn.

conditions are the other subdivision histologic-etiological factors. All three may be at times caused by syphilis; they may be the result of a virus infection, from bacterial



Fig. 42 (Spaeth). The bilateral internal and external ophthalmoplegia of old, quiescent lethargic encephalitis with Parkinsonism.



Fig. 43 (Spaeth). Ptosis of a frank, post-influenzal encephalitis. The course and development of the ptosis was classical for this. The situation remained unchanged for 20 years, and was corrected by the use of properly fitted crutch glasses as illustrated.



replaced with mucous-membrane grafts. Deformed tarsal plates can be removed at the time of a levator correction or adjustment. Socket reconstructions should spare the levator if it is still intact.

necessary estimated thereafter (fig. 8). It is important to remember, however, that this external approach to the levator tends to limit the total excursions of the lid even with ideal indications, and after most

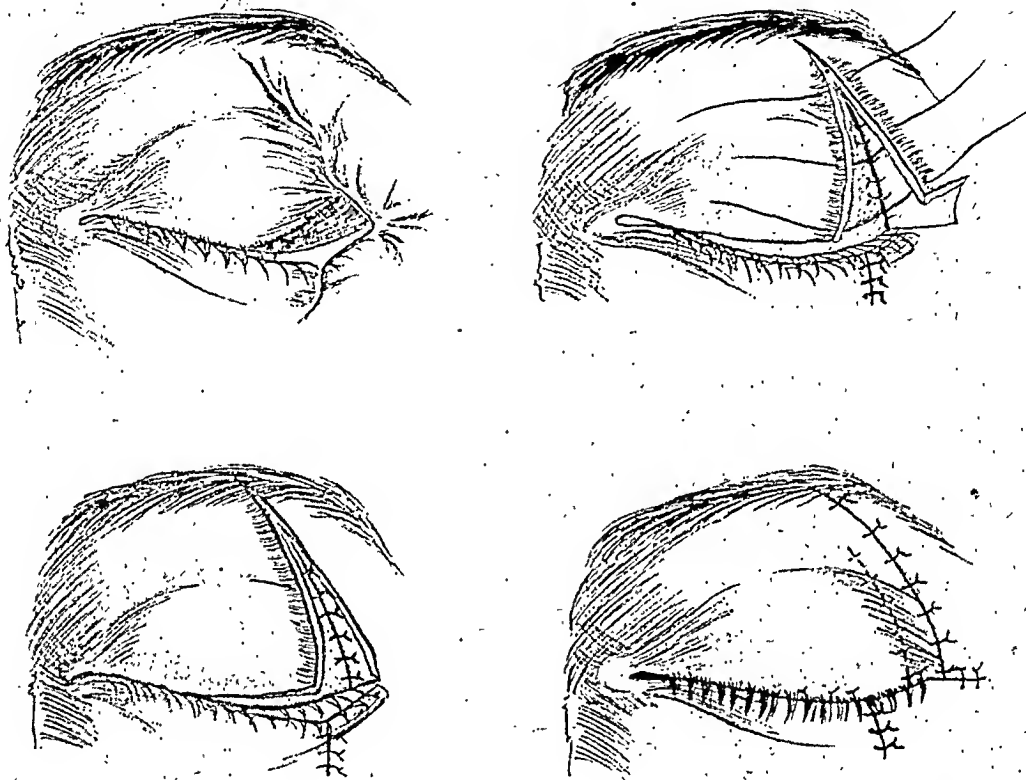


Fig. 48 (Spaeth). Scar resection, with offset suture lines. Correction for the ptosis of figure 3.



Fig. 49 (Spaeth). Ptosis correction following lid and cul-de-sac reconstruction by the use of the Hess technique.

In many of these cases wherein the levator can still be utilized, the external approach to this muscle, in the writer's experience, rather than the superior cul-de-sac approach, gives better end results. Adhesions and other accompanying deformities can be removed more readily, and the varying degrees of correction

satisfactory surgical results. The Hess procedure has its optimum indications in the correction of ptosis connected with any type of lid reconstruction. Such lids tend to be thicker than normal, motility is poor, at the best, and orbicularis fibers are deficient. While this surgical procedure affects lid excursions by reason of

the adhesions formed, this fault is of least importance and least serious in these cases (fig. 49).

Correction for the ptosis of class 3 (peripheral, inflammatory, or neoplastic, intraorbital pathologic change) presupposes the removal, if possible, of the underlying orbital condition, and, following this recovery, correction is achieved by the rules just outlined.

Correction for the ptosis of class 4 (atonic ptosis) is largely a matter of levator resection combined with the resection of the atonic skin. In addition, the skin is to be quilted to the anterior surface of the tarsal plate to prevent a recurrence of the basic condition.

Class 5. The ptosis of myasthenia gravis is not a surgical condition. The removal of a thymic tumor will correct thymic myasthenia. Medical treatment for thyrotoxic ptosis is frequently of no avail and the patient will need an orbicularis transplant for correction. Ptosis, when accompanied by an acquired paralysis of upward gaze, cannot be corrected surgically. If that is done, the cornea will be exposed during sleep. Because of this lack of upward movement, an exposure keratitis will certainly develop, and vision may be lost in that eye. Such conditions must be corrected, during waking hours, by the use of crutch glasses (figs. 41B, 42, and 43).

Class 6. The ptosis of cervical sympathetic paralysis, when this is a permanent condition, is easily corrected by a levator advancement—using the transconjunctival route. The partial tarsectomy, usually performed for the congenital form of ptosis, is to be omitted to prevent overcorrection.

Classes 2 and 7 (ptosis from third-

nerve involvement). These forms of ptosis, when permanent, are to be corrected by orbicularis or fascia-lata transplants; that is, by utilization of the action of the occipitofrontalis. All surgery, however, for the accompanying oculomotor paralyzes should be completed first to minimize diplopia, in fact, to correct it before the lid itself is lifted. The rules for the accompanying paralytic squint are well known and need no mention here.

Class 8. The ptosis of the pseudo-Graefe syndrome is to be converted into a completely paralytic form of ptosis by a levator myectomy and tenotomy. This will correct that distressing variability present under different circumstances. Following this, the surgery for the accompanying ocular paralyzes can be completed, and after that, the case brought to a functional recovery by an orbicularis transplant.

Class 9. The ptosis of hysteria has no surgical relationship.

#### SUMMARY

A very brief classification is presented, convenient for the consideration of the various forms of acquired ptosis of the upper lid. The surgical needs for the correction of these cases are varied and exacting. Suggestions for the maximum correction of these dissimilar situations have been presented in that these procedures outlined have proved satisfactory in many instances. Recognized indications demand varied methods for correction. One form of surgical technique will best correct only one group of conditions. Attention to this exacting situation should give excellent results; its neglect will bring disappointments.

1930 Chestnut Street.

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# OPHTHALMOLOGY IN PARIS DURING THE WAR

P. PRELAT, M.D.\*

Paris, France

During the war, under the German occupation, the practice and scientific activity of ophthalmology in Paris met obstacles of all sorts which hindered, but did not suppress, its practice. The progressive deterioration of transportation, the scarcity of lighting facilities, particularly of electricity, which eventually was almost completely lacking, the dispersal of a large number of our confrères that made it impossible for them to be present at the meetings of various scientific societies, all these unfortunate circumstances made any demonstration of our activity increasingly difficult. Besides, the societies could not obtain, for want of paper, the authorizations necessary for the publication of their journals, indispensable witness of their labors; moreover, it became less and less possible to hold the meetings as in normal times with any degree of regularity. The programs were always interesting and well attended, thanks to the devotion and commendable activity of their members.

*Journals.* The Archives d'Ophtalmologie and the Annales d'Oculistique for some time appeared in reduced size but finally were forced to suspend publication.

*Hospital services* were reduced by the loss of three of their best installations. The hospitals Beaujon, Lariboisière, and La Pitié were requisitioned by the occupying forces and their patients were redistributed throughout the remaining hospitals, these latter overcrowded by this additional influx of patients and by the reduction of medical personnel.

In spite of the material obstacles which sometimes seemed insurmountable and of the heavy, depressing atmosphere which weighed on everyone, ophthalmology in Paris succeeded in carrying on its daily task and in nourishing its scientific life with some degree of satisfaction. Proof of this lies in the long list, as yet incomplete, of communications, of which we shall give a résumé.

*Ophthalmological Society of Paris.* The activity of ophthalmologists was manifested here especially. Its meetings were somewhat irregularly held, since the beginning of the war. Unfortunately, the publication of its bulletin had to be suspended for want of the necessary authorization. The last issue carries the reports made from October to December, 1939. Later manuscripts have been preserved and will be published as soon as circumstances will permit. Choice among them is difficult to make and is somewhat arbitrary; but the great number of contributions makes this necessary. We offer our apologies to the authors and to the readers.

1940

## ASPERILLOSIS OF THE CONJUNCTIVA

MR. A. HUDELO. Membranous film developed on the inner surface of the upper eyelid after an operation for chalazion. Surgical treatments did not prevent the pathologic growth from recurring. Treatment with an iodide only brought about recovery. It seemed to be an aspergillus, the type of which could not be identified.

## A CASE OF HYSTERICAL AMBLYOPIA

MESSRS. BAILLIART AND DE MORA pre-

\* Ophthalmologist of the Hospitals of Paris. Because of transportation difficulties, the author has not been reached for a corrected proof.

sented the case of a young girl, aged 23 years, who without any objective sign suffered from considerable diminution of vision in both eyes. Her visual trouble began six months previously in the right eye, at which time it was considered due to a spasm of the central artery. The left eye was not affected until much later.

There exists a concentric narrowing of the visual field, yet the patient can get along very well. Variations in the field occur frequently. During the period of observation, a spasm of accommodation occurred which produced a mild degree of myopia.

The authors think that there is a basis of auto-suggestion, the origin of which is actually, perhaps, a spasm of the right central artery. This is a case of hysterical blindness from which a rapid cure can be expected.

#### OCULAR CIRCULATORY MODIFICATIONS IN TWO CASES OF CONGENITAL CYANOSIS

MR. A. DUBOIS-POULSEN. Observation of two children with cardiac malformation from patent septa and narrowing of the pulmonary artery, showing cyanosis and clubbing of the fingers. Retinas were red, with dilated arteries and veins. Venous pressure was almost equal to the pressure of the central artery of the retina. Considerable capillary stasis could be detected. Retinal cyanosis was increased with each cardiac systole; with each attack of cyanosis, pressure of the arteries approached that of the retinal veins. Whatever explains the cyanosis of the retina also explains the cutaneous cyanosis. Venous dilatation is dependent on the degree of stenosis of the pulmonary artery. The absence or presence of arterial dilatation may perhaps be a diagnostic feature with regard to the nature of the cardiac malformation.

#### SEVERE INFECTION OF A GLOBE PREVENTED BY EXTRACTION WITH AN ELECTRO-MAGNET OF AN INTRAOCULAR METALLIC SPLINTER

MESSRS. JEAN SEDAN, FARNARIER, MASTIER, AND GOULESQUE. A steel splinter was in the globe for about 48 hours, having penetrated deeply into the vitreous after perforating the cornea and the lens, causing a panophthalmitis. Extraction of the foreign body was followed by rapid resolution of the infection, which had threatened to be quite severe.

Messrs. Aubaret and Joseph had observed similar cases.

#### DIAGNOSTIC AND THERAPEUTIC POINTS OF THE FIGHT AGAINST TRACHOMA IN THE XVTH ZONE, FROM SEPTEMBER TO DECEMBER, 1939

MESSRS. JEAN SEDAN, A. KOUTSEFF, L. JEAN, AND R. GAZALIS. The blacks of the A.O.F. have very little trachoma. North Africans are more affected, palpebral scars are present to a large extent, pannus tenuis is more frequent than pannus crassus. The Tonkinese and the Annamites have very little trachoma, but are especially affected with the common forms of conjunctivitis. Recruiting of foreigners introduces it especially among the Italians and the Spanish. The latter are more frequently affected than the former.

The patients have been treated by brisk rubbing of the eyelids with gauze soaked in a strong solution of tannic acid in glycerin and weak instillations of the same given between treatments.

Lutazol or G33 used as subconjunctival injections and orally has given in the experience of the authors excellent results. Florid granulations have reacted very slightly, but it is efficacious in lesser granulations, pannus tenuis, trachomatous keratitis, and supra infections.

Mr. Bailliart confirmed the worth of sulfonamide treatment in trachoma.

#### A MEASURE OF OPTICAL AND VESTIBULAR CHRONAXIAS IN A CASE OF HYSTERICAL AMAUROSIS

MR. GEORGE BOURGUIGNON. Optical and vestibular chronaxias are notably increased in hysteria. This sign offers an important element for differentiation between hysteria and malingering, for, in malingerers, the reactions times are normal. When the malingerer refuses to recognize the presence of phosphenes, investigation of the vestibular chronaxia is indicated. Theoretically, the changes of chronaxias in hysteria prove that hysterical patients are really ill.

#### OCULAR PROTECTION AGAINST WAR WOUNDS

MR. ROCHON-DUVIGNEAUD. Two methods have been proposed: an eyeshade which can be lowered in front of the helmet and in which are cut flat horizontal apertures; a laminated shutter offering protection throughout the extent of the visual field.

The latter method is preferable.

#### MYDRIATIC COLLYRIA FOR CLINICAL USE

MR. MAGITOT. The effect of atropine is slow and the cycloplegia that it produces is often a disadvantage. Better results can be obtained with a combination of a parasympathetic colyonic drug whose action is on the pupillary sphincter and a sympathetic mimetic drug which acts on the dilator. Adrenalin, ephedrine, benzedrine sulfate, and like medicaments can be used. The sympathetic mimetic drugs diminish amplitude of accommodation without suppressing it; in combination with atropine, they seem to shorten the duration of the cycloplegia. Mydriasis is more rapid and greater.

#### SUBCONJUNCTIVAL INJECTIONS OF ADRENALIN IN HYPERTENSIVE IRIDOCYCLITIS

MR. BAILLIART reported the harmlessness and the efficacy of these injections made into the limbus.

#### A CASE OF TUBERCULOUS PRIMARY INFECTION OF THE CONJUNCTIVA

MR. P. BAILLIART presented the case of a child, aged 12 years, who had been affected since September last with lesions characteristic of primary tuberculous infection of the palpebral conjunctiva. Six months after the onset of these lesions, ulceration was still visible. The softened petrous ganglion enclosed the tuberculous bacillus. The author discussed the possible relation between Parinaud's conjunctivitis and tuberculous conjunctivitis, and noted that the penetration of the bacillus through the conjunctiva does not add to the gravity of the infection either from a local or a general standpoint.

#### BILATERAL OPTIC NEURITIS WITH MENINGEAL REACTION OF UNKNOWN ETIOLOGY

MR. A. MAGITOT. Bilateral papillary edema with blindness, loss of superficial abdominal reflexes and 11.6 cells in the cerebrospinal fluid, without pyrexia. The author compared it with Harada's disease, but confessed his inability to determine an exact etiology.

#### PREDOMINANCE OF GONO-REACTIONS OVER POSITIVE WASSERMANN REACTIONS IN THE COURSE OF IRIDOCYCLITIS

MR. DUBOIS-POULSEN. In 180 cases examined, 48 gono-reactions were positive, 127 negative, 5 doubtful, 13 Wassermann reactions were positive of which 2 were coincident with a positive gono-reaction. In conjunction with iridocyclitis, blennorrhagia is certainly more frequent than the classical statistics indicate.

# RECOVERY OF INTRAOCULAR FOREIGN BODIES IN THE FIELD BY FORTUITOUS MEANS

MESSRS. A. DOLLFUS, TROCHE, AND WILLEMIN have utilized in their specialty field hospital divers techniques to recover intraocular foreign bodies: (1) by a ring of silver wire (wire used by stomatologists) with a diameter the size of the globe, placed in the conjunctival cul-de-sacs or at the surface of the eyelids, following the shape of the globe; (2) by a contact glass, Comberg type, cut to a diameter of 13 mm., in the depth of which are tubes containing catgut or hair, on which four fine marks of lead were fixed by a drop of minium in order that the principal axes of the cornea might stand out; (3) by Velter's procedure, fixation of two pellets of lead on either side of the vertical diameter of the cornea; (4) for very small foreign bodies of the anterior segment, by radiography without shadow (Vogt's technique) on dental films. Some excellent radiograms of the globe and of the orbit have been obtained thus with the field radiograph apparatus of S. de S. and have made possible the extraction of numerous intraocular or orbital slivers.

## A PROBABLE CASE OF HARADA'S SYNDROME (BILATERAL IRIDOCYCLITIS WITH MENINGEAL SYNDROME)

MESSRS. A. DOLLFUS, R. GARCIN, J. GUILLAUME, AND R. TROCHE. Observation of a patient, aged 28 years, hospitalized for severe frontal headaches accompanied by high fever, by a mild splenomegaly and by meningeal syndrome (20 lymphocytes per cubic millimeter in the cerebrospinal fluid), and by an obscuring of the right frontal sinus. Trepanation of the frontal sinus, which seemed free from lesions, did not bring about improvement of the patient's condition. During

the following days, the appearance of a severe iridocyclitis of the right eye, with uveitis, prevented examination of the fundus. There were persistence of the meningeal syndrome, and of fever, the appearance of a bilateral Babinski's sign, and motor deficiency in the region of the right thigh. Lumbar puncture: 6 cells per cubic millimeter, Pandy and benzoin negative, Meinicke subpositive. The blood Wassermann reaction was negative. At the end of one month, a severe attack of the left eye occurred similar to that of the right eye, after which a slight improvement in that eye was noticed. The complete development of the infection could not be followed because the patient was evacuated to the rear after an observation period of two months.

The authors discussed the various differential diagnoses which could be brought up. An iridocyclitis secondary to an infected sinus cannot be considered because on exploration the sinus proved normal; syphilis, in spite of the Meinicke subpositive in the cerebrospinal fluid, can also be eliminated because of the evolutionary character with temperature of this ocular and central-nervous-system attack, both acute and subacute; furthermore, nothing whatsoever had been found previously, the blood Wassermann reaction was negative and the Pandy like the colloidal benzoin was negative in the cerebrospinal fluid.

The hypothesis of an abnormal form of spirochetosis having been raised, a sero-diagnostic test, made two months after the onset of the infection, proved negative. The diagnosis which seemed most likely was that of an atypical form of Harada's syndrome. Evidently neither chorioretinal detachment nor destruction had been observed, but these are very late phenomena; moreover, because of the intense vitreous disturbance, the retinal swelling, which perhaps existed already,

did not manifest itself. It is to be noted that the patient presented a cutaneous eruption similar to a versicolor pityriasis.

#### ANGIONEUROTIC EDEMA OF THE EYELIDS AND OF THE CONJUNCTIVA, ACCOMPANIED BY RETINAL EDEMA

MR. RENÉ NECTOUX reported a case of retinal edema occurring in a woman aged 33 years, during the course of an attack of Quincke's edema affecting the eyelids and the conjunctiva. He stressed the rarity of such a syndrome and described the edematous disturbance of the retina, characterized especially by an intense dilatation of the vessels, the caliber of the arteries being only a trifle smaller than that of the veins, with a very low local arterial pressure, in the neighborhood of the venous pressure. This ophthalmoscopic phase is comparable to that which the author was able to produce experimentally in a rabbit in the course of anaphylaxis.

#### A CASE OF MIKULICZ'S SYNDROME COMPARED TO THE DISEASE OF BESNIER-BOECK-SCHAUMANN

MESSRS. FAVORY AND PLUVINAGE presented the case of a young man exhibiting a typical Mikulicz's syndrome. Search for the usual etiologies—rhinopharyngeal infections, tuberculosis, syphilis, Hodgkin's disease—gave no result.

Nevertheless, since the radiograph of the thorax showed a micronodular picture of pseudogranulitis and the histologic section of a piece of the lacrimal gland showed typical epithelioid masses, a diagnosis of Besnier-Boeck-Schaumann's disease was considered.

It would be interesting to inquire into the cause in many cases of Mikulicz's syndrome where the etiology remains obscure.

#### STUDY OF THE CHANGES OF THE CENTRAL RETINAL ARTERY DURING SLOW INTRA-VENOUS INJECTIONS OF ACETYLCHOLINE

MR. VOISIN had been able, by this method, to inject up to 1 gm. of acetylcholine. He proved a lowering of the arterial retinal pressure minima, as well as a lowering of the arterial humoral pressure, a minimum dilatation of the central artery and its branches or a dilatation of the peripapillary arteriolar without changes of the central artery, so-called.

When the injection of acetylcholine was rapid, it produced a vasodilatation of the surface and of the main body without dilatation of the retinal arteries, which demonstrates well the independence of the peripheral and the retinal circulations.

#### ANATOMIC STUDY OF TWO CASES OF TUMORS OF THE OPTIC NERVE

MR. GUY OFFRET. The first was an almost wholly gliomatous tumor, the second a glioma evolving on a congenital dysplasia of the nerve and of the optic meninges (neuro-perineural gliosis). The author stressed the necessity of a topographical examination of the sheaths horizontal to and beyond the tumor.

#### REPORT ON INTRAOCULAR FOREIGN BODIES

MR. PROSPER VEIL. This work, studied for a long time, is a most complete exposition of the subject. Due to its completeness and complexity it is impossible to present an abstract. It must be read in its entirety.

#### COLOBOMATOUS MALFORMATION OF THE CRYSTALLINE LENS

MESSRS. VELTER AND G. OFFRET had observed a case of this malformation in a boy, 11 years old, who came to be examined for an error in refraction. The length of the equatorial rim of the crystal-

line lens on the right side seemed to be notched to an unequal depth. The zonule and the ciliary processes were equally changed with regard to this atypical coloboma.

1941

#### GEOMETRICAL APRACTOGNOSIA IN LESIONS OF THE OCCIPITAL LOBE

MESSRS. J. LHERMITTE AND J. MOUNZON, relying on their personal observations, demonstrated that vascular lesions which strike the peristriate area (field 18 of Brodinan) are accompanied by disturbances in recognition and identification of symbols along with the loss of constructive action.

Furthermore, to this syndrome is added alexia associated with loss of recognition of colors and paralysis of Balint's gaze. These syndromes can be combined with quadrant hemianopia, but visual loss plays no part at all in the genesis of geometric or symbolic apractognosia. Extramacular hemianopia, almost wholly calcarine, is not increased by the phenomena of apractognosia; these are evidence of the attack on the cortical zone which surrounds the "cortical retina."

#### PSEUDO-ACCOMMODATION IN APHAKICS

MR. DUDRAGNE. Several hypotheses can be made on the origin of pseudo-accommodation in aphakics.

(1) It can be supposed that adjustment of the optic system is accomplished by a lengthening of the antero-posterior axis; this hypothesis is definitely abandoned; the globe would have to change shape to an excessive degree.

(2) It can be supposed that adjustment is made by a displacement of the corrective lens. This second hypothesis is demonstrated in practice and proves

that numerous aphakics move their glass from the position for which it was intended.

(3) The tolerance of circles of diffusion on the retina by the cerebral interpreter system can be considered.

The author has, for purposes of research, brought a reading chart nearer to the eye until the patient can no longer read it. The amplitude of displacement of this chart (false distance of accommodation) has made possible the deduction by calculation of the size of the circle of diffusion on the retina.

Of the 23 cases examined, 14 were recognized as being a "false distance of accommodation" 15 to 16 cm.—that is to say, amplitudes of the order of 2.25 to 2.50 diopters (round numbers). In four cases the "false distance of accommodation" was only 5 cm.; in five other cases it was 20 cm.

By calculation and from his observations, the author evolves the tables which make it possible to choose the addition which will give the greatest "distances of false accommodation."

#### DETERMINATION OF ASCORBIC ACID IN CATARACTOUS CRYSTALLINE LENSES

Mlle. LASCO. Determination of ascorbic acid has been tried on 60 crystalline lenses by Tillemans's method. A notable diminution of the ascorbic acid has been found in all cases. The diminishing is more marked in the mature cataract (vision less than 1/10) where the proportion can be lowered to 0.005 mg. in the crystalline lens or 2.45 for 100 of fresh substance. It is equally more evident in the pathologic cataract than in the senile cataract and even more significant the older the patient. Traces of ascorbic acid are always present in spite of complete opacification or very advanced age.



## TETANUS AND FOREIGN BODIES OF THE CORNEA

MR. F. BOURDIER pointed out the absence of tetanus infection resulting from foreign bodies in the cornea; there exists only one positive observation, mentioned by Quentin at the Congress of the French Society of Ophthalmology in 1937, but it is clouded with suspicion, the first symptoms having appeared 16 days after the accident and the injured man, cared for at home by his family, was found to have come in contact with conditions such that the infection could have been the result of a later contamination.

To what could be attributed the anti-tetanic power of the cornea? The conditions of vitality of its tissues differ from those of other organs; the membrane, superficially, is avascular; its temperature is lower, the reactions of the epithelial cellules are affected in special circumstances.

In examining the various publications, one can look in vain for authentic examples of keratitic tetanus; given the immense number of foreign bodies of the cornea, one can say that they are not clinically generative of tetanus infection.

Experimentally, research has been undertaken at the Pasteur Institute in the laboratory of Dr. Dumas. The results of the first series of tests have been that in 24 hours the appearance of tetanus is determined by the injection of toxin (up to 100,000 units in the episclera, to 50,000 units in the vitreous and in the parenchyma of the cornea); on the other hand, the deposit of pure toxin on the corneas which induces a purely epithelial erosion is not followed by any systemic effect whatsoever.

The corneal epithelium is an insurmountable obstacle to the development of the bacillus as well as to the passage of the toxin into the general circulation. These clinical and experimental facts ex-

plain why superficial wounds of the cornea enjoy immunity with regard to tetanus.

## INDUCED ELEVATION OF ARTERIAL TENSION IN CHRONIC GLAUCOMA

MLLE. LASCO. Vasodilatation obtained by acetylcholine has, up till now, been the most widely used therapy in the treatment of glaucomatous optic atrophy with progressive narrowing of the visual field. Equally excellent results are obtained by raising the retinal arterial pressure with pressedrine.

## ANESTHESIA OF THE SPHENOPALATINE GANGLION IN LACRIMATION

MR. DUBOIS-POULSEN. The sphenopalatine ganglion is situated in the nerve paths controlling secretion of the lacrimal gland. Its anesthesia lessens, therefore, lacrimation in general and suppresses lacrimation of reflex origin. This therapeutic measure is worth using to combat lacrimation without stenosis of the lacrimal paths for which the cause is unknown.

## A CASE OF LOSS OF LIGHT REFLEX AND OF CONSENSUAL REFLEX WITH CONSERVATION OF MACULAR VISION FOLLOWING A FRACTURE OF THE ANTERIOR PORTION OF THE SKULL

MESSRS. DOLLFUS AND SOREL. Observation of a child, 14 years old, who, following a fall, sustained multiple fractures of the limbs and a left frontal fracture. After a period of coma, the child showed a total loss of vision in the left eye with mydriasis and complete immobility of the pupil, save for a consensual reflex brought on by illumination of the normal right eye. Illumination of the left eye did not produce any consensual reflex in the right. There was present in addition, a left paralytic ptosis and a paralysis of all movement of the globe. The serious state

of the patient and the syndrome of the complete section of the optic nerve made surgical intervention inadvisable.

Three weeks later, the movements of the globe began to reappear along with a certain degree of vision. Two months later extrinsic motility was normal, visual acuity was equal to from 2 to 3/10; the visual field was narrowed concentrically to 10° around the point of fixation. The papilla was pale and atrophied. In spite of the return of macular vision, illumination of the weak eye induced no consensual reflex of the opposite iris. There could be noted, moreover, an Argyll Robertson pupil.

It seemed very likely that there was a compression by a hematoma lying in the sphenoidal opening and the optic canal. The authors stressed the presence of the Argyll Robertson pupil, the loss of consensual reflex, and the mode of recovery of the visual field which began with central vision when, according to the rule, it begins in the periphery after traumatism of the optic nerve.

1942

#### INTRACRANIAL COMPRESSION OF THE OPTIC NERVE BY ARACHNOIDITIS OF ABNORMAL NATURE

MESSRS. SOURDILLE, DAVID, AND LEGRAND came upon papillary changes resembling those of thrombosis of the central vein. In the course of surgical intervention, they discovered profound changes in the disposition of the vessels in the chiasmatic region and in particular significant anomalies of the internal carotid resulting from arachnoidal strictures.

#### A CASE OF CANCER OF THE CAVUM. AN ATTEMPT AT HISTOLOGIC AND CLINICAL CLASSIFICATION OF MALIGNANT TUMORS OF THE CAVUM

MESSRS. H. TILLE AND Y. MIROUX.

This is a discussion of a tumor of the cavum, cervical and ganglionic at its onset. Ocular signs were successively a retrobulbar attack of the optic nerve, progressive and continued paralysis of the external ocular motor nerve on the same side, associated with a partial attack of the right trigeminal.

Diagnosis was delayed by the appearance of rhinopharyngeal signs and of severe epistaxes necessitating the ligation of the external carotid. Posterior rhinoscopy under the levator of the membrane exposed an ulcerated, budding tumor.

The development has continued two years, and has been but slightly influenced by radiotherapy.

The author mentions the different clinical and anatomic forms of cancers of the opening of the cervical ganglia.

The majority of these tumors are of a *sarcomatous fibroblastic type*. Their point of departure is lateral or tubular. The anterior-choanoid form develops like a nasopharyngeal fibroma.

*Epithelioma* arises after the fortieth year. Its site is tubular or in the choana. It is an epithelioma of the malpighian body in corneal or basocellular globes.

*Lymphocytoma* is a cancer occurring in the young, taking as its point of origin the vault of the cavum. It is a classical amygdaline lymphocytoma. This tumor is often ganglionic at first.

*Lympho-epithelioma* is quite frequent, its metastases are osseous or visceral and grow rapidly. Death can also result from a bronchopneumonia, repeated hemorrhages, or a meningitis severe in its progressive destruction of the meningeal coating of the skull.

#### NOTE ON SURGICAL TECHNIQUE IN EXENTERATION OF THE ORBIT

MR. H. TILLE. After subperiosteal exenteration, the orbital visceral pedicle is sectioned by means of the tonsil or poly-

pus snare. This method gave protection in meningeal wounds.

#### BAND KERATITIS

MR. GUY OFFRET. Observation of band keratitis appearing in a woman aged 78 years. This observation presented two peculiarities: an iridic change and lesions associated with the conjunctiva. The author believes that the origin of the disturbance is neural, which would explain the location on the horizontal meridian of the cornea and the disposition of the lesions in the anterior layers.

#### PARALYSES OF ACCOMMODATION DUE TO BOTULISM

MESSRS. M. A. DOLLFUS, JULIEN MARIE, AND MASURE reported six cases of botulism in which the diagnosis was established by ophthalmologic examinations, the principal symptom having been a paralysis of bilateral accommodation. In one case it seemed to be almost wholly an accommodative paralysis with only a paresis of the levator; in another there was complete internal ophthalmoplegia; the other cases were characterized by a pupillary diminution without paralysis of the extrinsic motility of the globe. No other muscular paralysis has been demonstrated, and notably no paralysis of the membrane of the palate. On the other hand, the patients evinced significant digestive disturbances. Ocular disturbances appeared very rapidly after ingestion of the toxic food (preserved beefsteak and poorly cooked, raw ham). Six cases were cured in a few weeks without complications after serotherapeutic treatment or by antitoxin and even without treatment in two cases. On the other hand a guest of one of the patients who had consumed a greater quantity of the toxic food died in a few days without any diagnosis of botulism being made and this could not be established other than in retrospect.

#### A PECULIAR ASPECT OF PUNCTATE RETINO- PATHY

MESSRS. PRELAT AND P. DUMONT presented a patient whose fundus revealed a peculiar aspect of punctate retinopathy localized unilaterally without change in visual acuity.

The authors pose the question of the cholesterine nature of the punctata; one determination, made at the onset of the disturbances noted, had revealed in effect a significant hypercholesterolemia.

#### A CASE OF VACCINAL KERATITIS

MR. R. NECTOUX. Vaccinal keratitis first appeared as a mild ulceration dendritic in character, then was followed by an infiltration of the corneal lamina of disciform keratitis. The author emphasized the analogy of the lesions with herpes.

#### TRABECULAR NETWORK OF THE CORNEA

MR. G. OFFRET made a new observation on the trabecular network developed on the posterior surface of the cornea. Absence of serious sequelae of anterior segmentation does not permit this case to be considered as a late evidence of an exudative inflammation of the walls of the anterior chamber. It seems more likely to be a growth of endothelium detached in the course of a process of interstitial keratitis, such as is always found in the origin of these conditions.

#### A CASE OF BLINDNESS FROM SULFONAMIDES was presented by MR. MONBRUN.

#### OPHTHALMOLOGY, AUXILIARY OF MEDICINE (STATISTICAL ANALYSIS)

MR. JEAN GALLOIS. Once in three or four instances complete ocular examination for a commonplace reason, such as the choice of corrective lenses, demonstrates the presence of lesions or of ocular or general disturbances of which the pa-

tient is unaware. Only a doctor can determine this.

#### THE EYE AND AVIATION (LECTURE)

MR. MERCIER. From this very interesting lecture, it was determined that in the piloting of modern aircraft complete perfection in all modes of vision is indispensable.

From physiologic considerations with regard to the sense of sight and the exigencies of aviation, the author elicited the conditions of visual aptitude requisite for flying personnel. He stressed the necessity of very exact examinations for visual acuity under variable lighting, but always exactly measured, for verification of peripheral vision and binocular vision. Then he enumerated the visual consequences of physical conditions under which the aviator flies and works: influence of speed, of cold, of altitude, of radiations, and of intoxication. From these examples he drew conclusions as to the value of the different phases of the examination and the influence that it could have in classifying pilots physiologically, according to the type of activity required of them.

#### A CASE OF STILLING'S SYNDROME

MESSRS. PRELAT AND DUPUY-DUTEMPS. Congenital absence of abduction with absence of deviation resulting from strabismus in the direct gaze and conservation of normal visual acuity in the affected eye. The prism of de Graefe permits correct binocular vision in the front position, the diploscope indicating that there is simultaneous vision.

Stereoscopic fusion, on the other hand, is nonexistent.

#### PRESENTATION OF A CAPSULAR FORCEPS (MODEL OF DR. FOURRIÈRE)

MR. BAILLIART. This is a modification of the forceps of Elschnig.

#### A NEW METHOD OF CONJUNCTIVAL SUTURE BY A. ROLLIN

MR. BAILLIART demonstrated the whipstitch without knots.

#### AVASCULAR RETINA FOLLOWING HEMORRHAGIC GLAUCOMA

MR. BÉGUÉ. A curious observation in which the only detail visible with the ophthalmoscope was the papilla, all retinal vascularization seeming to have disappeared.

#### CORNEAL LESIONS IN THE COURSE OF OCULAR HERPES ZOSTER AT THE ONSET

MR. RENÉ NECTOUX. The lesions had evolved toward the depth, following three phases: epithelial, parenchymatous, endothelial. The author noted the analogy with vaccine and herpes and the fact that the primary localization of the zosterian infection on the cornea is not always parenchymatous.

#### MONOCULAR DEPTH VISION

MR. J. PLICQUE. The superimposing on the same retina of two conjugate images which constitute a stereoscopic group tends to produce a depth perception of the object represented (a fact indicated earlier by Quidor and Herubel). The stereogenetic effect is neither regular nor constant; it is equally obtained by the imperfect superimposition of any two similar images whatsoever. Observations lead to consideration of the most pronounced of the images as most nearly approximating it.

These experiments do not authorize a rejection of the classical concepts concerning depth perception with its binocular component, specific sensation, and its accessory subjective component, linked especially to memory of shapes, colors, and contrasts presented by customary things. They do permit, however, to be demon-

strated that the physiologic neutralization, necessary to binocular vision without diplopia of objects in relief, is not a purely passive phenomenon. Habitual association of depth vision and of neutralization would create an elastic reversible link between the two phenomena, the accidental appearance of the neutralization sufficing in its turn to orient our visual perceptions toward the calling of three-dimensional objects.

#### A MODIFICATION IN THE PROCEDURE OF POULARD IN THE SURGICAL CURE OF SPASMODIC ENTROPION

This was reported by Mr. JEAN VOISIN.

#### MALIGNANT EXOPHTHALMIA IN BASEDOW'S DISEASE

MESSRS. H. WELTI AND G. OFFRET, in connection with a characteristic observation, indicated the symptoms of malignant exophthalmia in Basedow's disease. The attack on visual function by disturbance of the sensory conduction had the appearance of a true manifestation of this exophthalmia. A single efficacious treatment can combat this formidable complication; decompressive trepanation of the orbit by a personal technique.

#### EPITHELIAL PUNCTATE KERATITIS WITH RELAPSES, IMPROVED BY CERVICAL NOVOCAINIZATION

Mr. G. OFFRET. A 27-year-old woman had been troubled for almost a year by a stubborn bilateral punctate epithelial keratitis. Anesthetic infiltration only of the carotid plexus brought about an end of the disturbance, which reappeared at the end of four to five weeks. After several novocainizations, the keratitis began to disappear.

#### TRANSITORY MYOPIA IN THE COURSE OF QUINCKE'S EDEMA, PALPEBRAL AT THE ONSET

Mr. S. VOISIN. Association of a transitory myopia and a facial Quinke's edema. The following pathogenic hypotheses were considered: imbibition of the ciliary body, rupture of the osmotic equilibrium of the crystalline lens, increase of the indices of refraction of the ocular media. The myopic state was independent of all active accommodative mechanism.

#### A CASE OF OPTO-CHIASMATIC ARACHNOIDITIS OPERATED ON AND CURED

MESSRS. CHAPPÉ AND DAVID made this report.

#### NEW TECHNIQUE IN THE REMOVAL OF TUMORS OF THE POSTERIOR POLE OF THE ORBIT

MESSRS. GUILLAUME AND DOLLFUS demonstrated this procedure.

#### GRAY ATROPHY OF THE PAPILLAE OF AN INFANT

Mr. G. OFFRET. Presentation of a four-months-old baby, born blind. The light reflex was very slow, the pupils were abnormally large; in the fundi the papillae were gray. This lesion corresponds in all likelihood to the affection described by Beauvieux under the name of "pseudo-optic atrophy of the newborn" and for which the general prognosis is favorable.

#### SOME LITTLE-KNOWN OCULAR MANIFESTATIONS IN BASEDOW'S DISEASE

MESSR. H. WELTI AND G. OFFRET, in connection with unpublished observations, described some phases of ocular complications, scarcely classic, in those having Basedow's disease: accommodative difficulties, spasmodic tearing, Charlin's syndrome, anesthesia of the cornea,

neuro-paralytic keratitis, depilation of eyelashes and eyebrows. The pathogenesis of these various manifestations is not unique. The general neuro-vegetative irregularity of the disease finds its particular expression in the visual apparatus by the symptoms which have just been named.

1943

#### INTRACULAR SARCOMA EVOLVING FOR 34 YEARS

MR. E. JOSEPH. In this patient an intra-ocular sarcoma was diagnosed for the first time in 1908 by Dr. Chevallereau. In January, 1942, an enucleation, performed because of a particularly painful attack, revealed a sarcoma diffused in the orbit, and was then followed by a subperiosteal exenteration of the orbit. For one year the patient has shown no sign of local recurrence nor of metastasis.

#### A CASE OF RECURRING OPTO-CHIASMATIC ARACHNOIDITIS

MESSRS. J. M. GUILLAUME AND E. JOSEPH. This deals with a patient who showed loss of vision in June, 1941; visual acuity in December was 1/100 with the right eye and 1/10 with the left when she was operated on for an opto-chiasmatic arachnoiditis. Forty-eight hours after the operation visual acuity was restored to normal in each eye. In September, 1942, there was the beginning of a new loss of vision; in November it was reduced to perception of hand movements in the right and to 1/10 in the left eye, with a bitemporal hemianopia. On the 1st of December vision O.D. was 0, with loss of photomotor reflex and O.S. was perception of hand movements in the nasal field. On December 7, 1942, another intervention in the opto-chiasmatic region was made in order to remove a sub-chiasmatic arachnoid cyst. Forty-eight

hours later vision was normal in each eye, and on December 14, 1942, it was noted that vision O.U. was 10/10; the visual fields were normal. The fundi were normal throughout all the course of the infection. The authors stress the difficulty they encounter in finding a satisfactory physiopathologic explanation of the evolution of this attack on the optic nerve; slow loss of vision for several months, complete suppression for 15 days of light perception, complete and rapid cure after intervention, all without change in the ophthalmoscopic aspect.

#### SYNDROME OF GROENBLAD AND STRANDBERG. ELASTIC PSEUDO-XANTHOMA WITH ANGIOID STREAKS IN A DIABETIC

MESSRS. L. GUILLAUMAT AND P. HALLOT-BOYER presented a patient suffering from this curious affection whose cutaneous lesions Darier described in 1896, the coexistence with angioïd streaks having been reported only in 1929 by Groenblad and Strandberg. In the present case a great diminution of vision, especially noticeable in the left eye, was explained by exudative, hemorrhagic, and pigmentary lesions of the two macular regions. Equally in the right eye and in the left the papilla was surrounded by an irregular slate-gray ring from which spread jagged streaks, undercrossing the vessels and disappearing in the region of the equator.

Personal and hereditary history of this patient revealed nothing pathologic. General investigation disclosed only a beginning menopause and a strong hyperglycemia without acidosis or glycosuria. The establishment of an antidiabetic routine led to modification of the macular lesions of the fundus, rapid disappearance of the hemorrhagic clots and sufficiently good recovery of visual acuity. A picture of the angioïd streaks showed no other change.

A cervical cutaneous biopsy had con-

firmed the existence of the elastic pseudo-xanthoma of Darier with an overloading of the derma in elements colored with orcein: numerous elastic fibers, swollen and jagged, on the way to degeneration.

#### CAN THE AGE OF A CHOROIDITIC LESION BE EVALUATED

MR. ANDRÉ HUDELO. Presentation of two patients who exhibited the characteristic spots of cicatricial choroiditis of the so-called "old" type (white patches more or less surrounded by pigment. Eight days before this definitive phase could be described (which is usually considered as arising in months or years) there was nothing on the choroid. It must be thought then in the presence of a spot of cicatricial choroiditis that its growth can arise in the preceding days.

#### THE PROBLEM OF THE RELATIONSHIP BETWEEN UVEITIDES AND CERTAIN INFECTIONS OF NEUROTROPIC VIRUSES

MESSRS. GUY OFFRET AND PAUL BREGEAT, with regard to two original observations, posed the question of the relation between recurrent infections of the uvea and diseases of a neurotropic virus.

The course of certain uveitides is quite comparable to the development of disseminated scleroses or of encephalitides. It is not solely a question of coincidence but of morbid disturbances that, in all probability, unite the physio-pathologic links, which are quite limited.

#### TRANSITORY MYOPIA FOLLOWING SULFONAMIDE THERAPY

MESSRS. MONBRUN AND JOURDY. This is the case of a woman, 48 years old, who at the time of a pyodermitis underwent sulfonamide medication. For three consecutive days she took three tablets of 20 cg. of rubiazol. This treatment was interrupted for seven days. On the following day after the resumption of sulfonamide,

there appeared a myopia of four diopeters in both eyes. Vision, reduced to 2/10, was normal with glasses to correct the myopia. Treatment was stopped. The myopia disappeared in six days. This case is similar to nine others published in France and in other countries. It draws attention to a possible sensitization. In several of the cases published the myopia in effect appeared after the resumption of sulfonamide treatment interrupted for several days.

#### BLINDNESS FROM BILATERAL OPTIC ATROPHIC NEURITIS FOLLOWING SULFONAMIDE THERAPY

MR. MONBRUN reported the case of a woman whom he saw with Mr. Laedrich at the Necker Hospital. The case occurred in a 34-year-old woman affected with bronchiectasis. At the time of congestive pressure with fever, she had taken and well withstood sulfapyridine. A fresh supply of this medication having provoked nausea, the sulfonamide treatment was not continued. Three weeks later the patient was put on sulfathiazole. From the 2d of March to the 7th of March, 1942, she took 38 gm. of this. On the 7th of March, the last day of the treatment, the patient experienced a considerable loss of vision. An optic neuritis, retrobulbar at the onset (with a central scotoma for colors) developed within several weeks into a complete atrophy of the two optic nerves.

Seven days after the cessation of treatment, a blood test still showed 2.25 mg. percent of sulfonamide. It was thought for several days to be a polyneuritic disturbance purely sensory in form (tingling, analgesia with stinging, thermic anesthesia). This patient showed no anterior ocular defect. Renal function was normal. She had not taken during the preceding weeks any medication that could be considered suspect. It seems

necessary to inquire if the preliminary supply of sulfapyridine had not created a state of sensitization.

#### SEALING OF CAVITIES AFTER ENUCLEATION WITH POLYVIOL

MR. OUDOT (a war prisoner). Polyviol is a plastic substance very well tolerated by the tissues. Thiel, of Frankfort, advised its use to improve ocular prostheses. The ball, kept sterile in blood serum, after enucleation is fixed in the crater of the muscles which are sutured in front of it. If the necessary precautions are taken, the foreign body is well tolerated and the prosthesis perfect.

#### SOME REFLECTIONS ON THE CLINICAL ASPECT OF OCULAR TUBERCULOSIS

MR. BAILLIART, enumerating the works which have most recently appeared in France on the question, recounted the hesitation still encountered among many French ophthalmologists and phthisiologists in giving to ocular tuberculosis the importance and the extensiveness that is accorded to it elsewhere, and asked that this question take its place for general investigation.

#### ACUTE OPTIC NEURITIS COUPLED WITH THE INGESTION OF METHYL ALCOHOL

MESSRS. J. BOLLACK AND JEAN VOISIN reported a case of ingestion of methyl alcohol. On the sixth day, vision O.D. was 1/50; O.S. was 1 d. to 0.20; there was absolute central scotoma for green and red in the peripheral field. Visual disturbances progressed for the first 15 days to end in blindness in one eye and a considerable loss of vision in the other; changes in the visual field carried over at the same time to the central and the peripheral fields, this last attack in an asymmetrical manner but with predominance of loss on the nasal side. When the disturbances subsided, visual acuity im-

proved to 1/50 and the peripheral visual field was restored while the central scotoma persisted; on the fortieth day, papillary discoloration became evident. The authors pointed out the numerous cases in the foreign literature and stressed the prophylactic measures that must be taken to avoid an increase in such poisonings from methyl alcohol.

#### TWO OBSERVATIONS OF SERIOUS HEMORRHAGES AFTER CHALAZION OPERATION

MESSRS. COUTELA AND MORAX indicated a treatment which stopped hemorrhage instantly; curettement of the operative cavity.

#### A CASE OF BLINDNESS AFTER INGESTION OF METHYL ALCOHOL

MESSRS. BOLLACK AND VOISIN made this report.

#### TWO CASES OF INTOXICATION FROM INGESTION OF METHYL ALCOHOL WITH SERIOUS VISUAL DISTURBANCES

MESSRS. PRELAT, PIERRE, DUPUY-DUTEMPS, AND ARDOUIN. The authors followed two patients who 48 hours after the absorption of a massive dose of methyl alcohol definitely became blind. The lesions of the fundus were manifest at first under the aspect of a bilateral papillary stasis which rapidly evolved into an optic atrophy.

#### PALPEBRAL DERMOID CYST ASSUMING THE CLINICAL ASPECT OF A CHALAZION

MR. MAUSSON. Removal of a palpebral tumor assuming the clinical aspect of a chalazion, but which had recurred rapidly following the first intervention, showed that it was a question of extensive palpebral lesions. Anatomic-pathologic investigation: dermoid cyst.

Diagnosis was made of an adenoma or a meibomian epithelioma.



# SLOW APPEARANCE OF HEMORRHAGE FOLLOWING EXTRACTION OF A CHALAZION

MR. MAUSSION. Massive hemorrhage appearing at the operative scar after exeresis of a chalazion, slow at its onset; fifth day. Blood test revealed a very high clotting time. It seemed to be an acquired hemophilia of recent date.

The relative frequency of these hemorrhages in the course of removal of chalazions was discussed.

# A NEW CASE OF MYOPIA FROM SULFONAMIDES

MR. PIERRE DESVIGNES made this report.

# PREPAPILLARY DRUSEN (PRESENTATION OF A PATIENT AND OF COLOR PHOTOGRAPHS)

MR. LAIGNIER presented a case of prepapillary drusen covering a surface equal to about 15 papillae. He thought it to be congenital in aspect. Although the papilla and the chorioretina were normal, he hesitated to attest to their perfect soundness, only the future would determine whether the changes habitually noted would occur. The retina which covered the hyaline verrucosity, at least at its margins, although transparent and seemingly separated from its pigmentary layer, was still capable of transmitting light stimuli.

# OPHTHALMOSCOPIC PHOTOGRAPHY IN COLOR IN A CASE OF PROBABLE HYALINE DEGENERATION OF THE PIGMENTARY EPITHELIUM

MR. H. TILLE. Color photography of the fundus made it possible in this case to determine the vascular and retinal topography, and the topography of the hyaline mass itself in the pigmentary epithelium of the retina.

# OPTIC ATROPHY FROM AN OBLITERATING RETINAL SYPHILITIC ANGIITIS IN A CHILD

MR. G. OFFRET. Presentation of a subject, aged eight years, who became blind in six months. Examination of the fundus showed in both eyes an optic atrophy with clearly defined edges. The retinal vessels (arteries and veins) were almost all transformed into thin white lines. Furthermore, several patches of bilateral disseminated chorioretinitis could be seen. Treatment had no effect on these lesions manifestly cicatricial.

# INTOXICATION FROM METHYL ALCOHOL AND OPTIC ATROPHY WITH DESTRUCTIVE DEVELOPMENT

MR. R. PERRIN (Lyon). Observations in which the author reported three cases of complete and definitive blindness from the absorption of "lozenges" with a methyl-alcohol base.

# TWO CASES OF INTOXICATION FROM METHYL ALCOHOL

MESSRS. KALT, L. GUILLAUMAT AND M. MOULIN presented two cases of bilateral papillitis following the ingestion of methyl alcohol. In the two observations visual disturbances appeared three or four days after the intoxication: amaurosis of one eye and mere light perception in the other, with bilateral loss of light reflex. Pupillary reflexes progressively reappeared while the vision improved; at the end of one month it was about 9/10 on one side and 1/50 on the other because of a central scotoma, the peripheral visual field being relatively preserved. During this time the papilla lost color at the same time that the edema disappeared.

Purely symptomatic, the treatment consisted of injections of lukewarm novocaine retrobulbarly, of acetylcholine-papaverine, and of vitamin B.

#### TREATMENT WITH GLYCOCOLL IN TWO CASES OF PARALYSIS OF ACCOMMODATION OF DIPHThERITIC ORIGIN

MR. R. NECTOUX. The encouraging results obtained by various experimenters in the course of treatment of myopathies have suggested to the author the utilization of glyecoll in treatment of certain affections of the ciliary muscle, accommodative asthenopia, paralysis of accommodation. He reported two observations of paralysis of accommodation from an isolated diphtheria in which a cure was obtained rapidly and indisputably by glyecoll alone.

#### OPHTHALMOSCOPIC PHOTOGRAPHY IN COLOR OF A CASE OF AMBLYOPIA FROM METHYL ALCOHOL

MR. H. TILLE. It makes possible the localization of peripapillomacular edema in the cerebral layers of the retina, in conformity with the theory of Dr. Dupuy-Dutemps of a primary attack of ganglion cells. Discussion of the existence of appearances in photographs unobservable in ordinary ophthalmoscopy or "novae" ophthalmoscopic photography.

#### ACTION OF NICOTINIC ACID IN A CASE OF OCULAR HYPERTENSION

MR. J. GALLOIS reported his recent research in the medical treatment of chronic glaucoma; he believes that he has evolved the principle that a vasodilator substance can have a favorable action on ocular tension, on visual acuity, and on the visual field at the same time, but on the condition that this action is exercised on the capillaries rather than on the arterioles and that this action can be restricted. The test that he made with ingested nicotinic acid shows that at the same time that the cephalic vasodilatation is elective, a significant lowering of ocular tension can be recorded with, in one case, an improvement in visual acuity.

#### THE QUARTER OF A DIOPTR

MR. J. GALLOIS noted that the correction of an isolated astigmatism of one quarter of a diopter can be the sole therapeutic means of completely ending a subjective painful syndrome of accommodative asthenopia, with general reservation, in certain cases of organic deficiency, among which he has already reported with Mr. Ch. Flandin the presence of angiohypotonia.

#### WELL-ADVANCED RETINAL ARTERIOSCLEROSIS: SUBSEQUENT DEATH FROM MENINGEAL HEMORRHAGE

MR. J. GALLOIS pointed out the case of a man, 37 years old, with a reputed vascular heredity; first examination, performed for the correction of a very mild hypermetropia, showed nothing abnormal to a layman; examination of the fundus, that only a doctor could make, brought out the assumption of the presence of parietal lesions, vascular rather than general, which was actually the case; from these lesions the patient died at the age of 45 years.

The presence of these latent lesions, that only the examination of the fundus revealed, is much more frequent than is believed; ophthalmologic examination can disclose them at the time of consultation for an apparently minor cause and particularly when selecting corrective lenses.

#### THREE CASES OF INCLUSION FROM ESERINE IN OIL IN THE ANTERIOR CHAMBER AFTER RECENT CATARACT OPERATIONS

MESSRS. MERIGOT DE TREIGNY AND J. P. JOLY reported three observations of inclusion from eserine in oil in subjects operated on uneventfully, whether total extraction or extraction after dissection. Of these three cases in only one was the foreign matter well tolerated; the others showed inflammatory incidents. Experimentation on animals showed reactions

analogous to those observed in man. The authors attribute the mechanism of the penetration and the incidents which follow to the poor quality of the excipient used.

#### ESSENTIAL PROGNOSIS IN GLIOMA OF THE RETINA

MR. J. BRUNEAU reported 74 observations histologically controlled, allowing a ratio of 26.5 per 100 decs. He estimates that the age of the child is not of much value from the point of view of prognosis, which is influenced rather by the earliness of the enucleation. A delay of three years seems sufficient to consider the cure as assured from the standpoint of the enucleated eye. He does not seem favorable toward an accompanying treatment by irradiation.

#### CHIASMATIC SYNDROME IN THE COURSE OF A CRANIO-PHARYNGIOMA. POSTOPERATIVE DEVELOPMENT

MESSRS. PRIEUR AND PUECH reported on this subject.

#### SIX CASES OF BOTULISM WITH OCULAR MANIFESTATIONS

MESSRS. DOLLFUS, JULEIN MARIE, AND MAZURE report six observations characteristic of botulism with ocular manifestations. They stressed the signs which make diagnosis possible: paralysis of accommodation, even though without other attack on the ocular musculature, and previous digestive disturbance (consumption of preserved or stale foods).

#### A CASE OF BOTULISM AMBULATORY IN FORM

MESSRS. VOISIN AND MAISON have noted a mild case of botulism whose manifestations (accommodative paralysis, paresis of the membrane, and dryness of the mouth) appeared in three days after a suspect meal followed by diarrhea for 48 hours. A right facial paresis was also

present. Cure in one month after treatment with antitoxin and antibotulinic serum.

#### A CASE OF GLIOMA OF THE RETINA TREATED AND CURED BY X RAYS

MESSRS. BÉGUÉ, LE GOFF, AND A. LEHMANN. Observation of a five-year-old child whose eye was enucleated because of glioma of the retina, which was verified histologically. Involvement of the other eye three months later. Since the parents refused enucleation, X-ray therapy was given according to an unpublished technique. For four years the healing has been sustained; only one spot of chorioretinitis is present in the fundus; the child seems to have good vision.

#### A CASE OF TRANSITORY MYOPIA FROM THE ABSORPTION OF SULFONAMIDE IN WEAK DOSAGE

MESSRS. NECTOUX AND DANSÆRT. New observation of myopia from a sulfonamide. The interesting fact in this case lies in the absence of sensitization by previous dosage of the medication.

#### METASTATIC CARCINOMA OF THE CHOROID TREATED BY RADIOTHERAPY; LOCAL HEALING

MESSRS. J. VOISIN, MALLET, CL. BONDON, AND LECAMUS. A 53-year-old woman, operated on for a cancer of the breast in 1940, underwent an enucleation of the left eye in December, 1942, for a metastatic choroidal tumor. In January, 1943, she showed loss of vision with the right eye: it seemed to be a right choroidal metastasis at its onset. Treatment with radiotherapy reaching 25.00r per treatment to 150r brought about local healing. In 14 days there was regression of the protuberance, in two months return of normal vision. In the fundus the slightly elevated subpapillary area was thin and had a grayish tinge. Roentgen therapy was,

therefore, able to change the visual prognosis in carcinomatous metastasis of the choroid.

#### A CASE OF MYOPIA OF SIX DIOPTERS FROM ABSORPTION OF SIDENAN

MR. MERIGOT DE TREIGNY. In this observation myopia was due to a spasm of accommodation (reaction favorable to atropine). The incident seems to have been released by a true sensitization.

#### A CASE OF BOTULISM WITH OCULAR COMPLICATIONS

MESSRS. BARGY AND HUSSET discussed such a case.

#### BOTULISM

Lecture given by PROFESSOR LEGROUX of the Pasteur Institute, who drew his invaluable teachings from all the observations of botulism recently published.

There are mild, ambulatory forms of toxic infection; beginning with intestinal discomfort, general malaise, headaches, they result in a few hours in a lowering of visual acuity for near (and for distance in the hypermetropic) to an impossibility to read, which indicates paralysis of accommodation, since a convex glass immediately reestablishes vision. The pupil and its reflexes are usually not affected, although other paralyses of the cranial nerves can be seen. The mouth is dry, and constipation customary. Within several days by the use of specific sera or of antitoxin these disturbances improve and disappear.

There are, unfortunately, some cases with more severe, even fatal, outcome following ingestion of massive quantities of toxin: digestive and visual troubles are early and severe; ptosis and mydriasis are expressed in a diffuse attack of the neuraxis. The general condition grows rapidly worse and death results in a few days.

In all these observations a group of

symptoms makes it possible to establish the botulinic origin of the paralysis of accommodation. These are: absence of attack on the membrane of the palate, association of digestive disturbances; constipation, dryness of the mouth, offensiveness of the breath, dysphagia.

Investigation ought especially to seek out the source of the toxic product: preserved meat (pork especially) or leguminous vegetables (peas, green beans).

Strictly anaerobic, the botulinus bacillus is developed in preserved foods badly prepared and badly sterilized. It is often present in hams insufficiently salted and smoked, but it does not follow that the whole piece is contaminated; the infected portions, lying in the vicinity of the bone or extending along the aponeuroses, have a grayish appearance and are riddled with holes. Salt added to lard is bacteriostatic, but not antiseptic. The botulinus spore is resistant to heat only in a fatty medium; in an aqueous medium it succumbs at 67°C.

This explains the frequency of the intoxications following consumption of preserved pork and goose (a meat very high in fat content).

Too many precautions in preparing foods for the family cannot be taken; the old traditional rules are sure and we will do well not to discard them: do not kill for preserving between Easter and All Saints' day; divide the work, so that two different persons prepare the meat proper and the entrails: smoke ham a long time so that the tar-products have time to penetrate it deeply: heat preserved foods a long time, so that a sterilization temperature can reach to the center of the piece.

As to the difference in preserved foods wherein certain portions remain edible along with other portions which are infected, the preserving liquids of the legumes, green beans, spinach, are toxic

as a whole: on opening containers of peas which have been infected, there sometimes arises an odor of syringa or acacia which ought to arouse suspicion. Tomatoes, on the other hand, are never botulinogenic.

It must be realized that suspected preserved foods can be eaten, but only immediately after they have been warmed to 100°C., a temperature which destroys the toxic agents.

Biologic characteristics make it possible to define two types of botulinus bacilli: A and B secrete two different toxins which do not confer reciprocal immunity; in our regions, it is always a question of *Botulinus bacillus B*, whose toxigenic power varies also according to the source.

Treatment of botulinic poisoning will employ serotherapy B in average doses: 20 c.c. intramuscular + 20 c.c. subcutaneously per day.

Antitoxin is useful in serious cases and in order to prevent the sequelae of poisoning.

1944

#### ACTION OF NICOTINIC ACID IN A CASE OF HIGH MYOPIA WITH CHOROIDOSIS

MR. JEAN GALLOIS utilized the action of this capillary vaso-dilator, showing a high myopia complicated by a posterior staphyloma of average dimensions, and obtained very appreciable visual improvement.

#### ACQUIRED DEFORMATION OF THE CRYSTALLINE LENS FROM AN INTRAOCULAR TUMOR

MR. FELGINES reported the observation of a patient affected with a melanotic sarcoma of the choroid in whom deformation of the crystalline lens by compression of this tumor was the only objective sign that explained the considerable lowering of visual acuity. This functional disturbance, which led the patient to come for

consultation, thus permitted a diagnosis before the appearance of the classic signs of detachment or of hypertonia.

#### PROLONGED SPASM OF THE CENTRAL RETINAL ARTERY IN A WOMAN AT THE PRE-MENOPAUSE. ROLE OF THE ENDOCRINE GLANDS IN THE GENESIS OF ARTERIAL SPASMS

MR. KOUTSEFF, with regard to this observation, drew attention to the role that a polyglandular insufficiency can play in the genesis of these arterial spasms and to the action of hereditary syphilis and of hereditary tuberculosis in the origin of this insufficiency. Nevertheless, specific treatment does not generally act on hereditary syphilitic lesions of glandular cicatricial sclerosis.

#### APPEARANCE OF FUNCTIONAL DISTURBANCES AT THE AGE OF 35 YEARS IN A PATIENT WITH CONGENITAL BUPHTHALMOS

MR. DUBOIS-POULSEN studied the case of a patient, one of a family of four children, three of whom were suffering from infantile glaucoma. Buphthalmos began in his early childhood without affecting visual function. Only when he reached 35 years did the papillary excavation appear and also diminished vision, although tension seemingly did not rise above 30 mm. Operations and medical treatment proved ineffectual in stopping the progress of the malady.

#### NOTES ON THE ACTUAL RECURRENCE OF A SPASM OF ACCOMMODATION IN CHILDREN

MR. RENÉ NECTOUX had for some time noticed the recurrence of cases of "spasmodic myopia" observed in children. Usually of mild degree, it reaches or surpasses on rare occasions two diopters; most often, but not always, bilaterally. Suitably treated, it disappears, generally

speaking, quite rapidly. Treatment requires above all the instillation of atropine for several days consecutively; then optic correction can be prescribed. General treatment plays an essential part, since it aims at reestablishing equilibrium of a deficient dietary regime, cause of the visual trouble. The lack that can most particularly be incriminated bears on mineral salts, vitamins, aminic acids, and glucose. It is, therefore, to a polyvalent therapeutic that we must have recourse. Calcium gluconate will always be prescribed; lack of calcium, very frequently observed in a normal period, is accordingly influenced by dietary limitations.

#### PENICILLIN IN SEVERAL CASES OF OCULAR INFECTION

MR. DUBOIS-POULSEN's experiments with penicillin in several patients led him to conclude that the effect of this product on the staphylococcus is remarkable. Clinically the sulfonamides cannot approach its constancy and its rapidity of action on this microbe. In ocular pneumococci, penicillin seemed to act more efficaciously and brought about cures in those cases wherein the sulfonamides were ineffectual, for example in infectious ulcers of the cornea. Sulfonamides gave very unreliable results in panophthalmias when the causal agent was not streptococcus. The results from penicillin were more brilliant. The future will have to prove the respective indications for the use of the two products, which cannot fail to be beneficial when the task is completed.

#### TUBERCULOUS SCLEROSIS OF BOURNEVILLE (EPILOÏA) WITH RETINAL LESIONS

MESSRS. DEGOS, J. LEREBoullet, AND G. RENARD presented a patient suffering from the tuberculous sclerosis of Bourneville, complete from the standpoint of

symptomatology. This patient showed bilateral patchy lesions of the retina. Furthermore, in a short space of time there appeared a bilateral papillary stasis with syndrome of intracranial compression.

#### FOSTER-KENNEDY SYNDROME IS NOT ALWAYS A SIGN OF LOCALIZATION.

MESSRS. PUECH, DESVIGNE, AND DESCLAUX. Characterized by an optic atrophy on one side with a central scotoma, marked visual loss, and papillary stasis of the opposite side, the neuro-surgeons feel that this syndrome is characteristic of a stricture of the optic nerve on the side of the optic atrophy. But it is not always a question of a tumor situated near the constricted optic nerve, and there is a tendency to forget that the optic nerve can be constricted by remote tumors; several cases of this have been published. These authors report the observation of a patient presenting a Foster-Kennedy syndrome, in whom the constriction of the optic nerve was discovered by the dilatation of the third ventricle with blockage of the aqueduct of Sylvius, the whole following a process of arachnoiditis, as the ventriculograph, intervention, and autopsy proved.

#### INTRAOCULAR TOLERANCE TO SLIVERS OF ALUMINUM COMING FROM EXPLOSIVE BOMBS

MR. JEAN SEDAN reported the observation of four ocular patients wounded by explosive bombs who were perfectly able to tolerate fragments of aluminum intraocularly. These cases show that it is advisable to leave these slivers of aluminum in place, avoiding useless trauma of the globe, certainly less harmful than the present method.

#### A RARE VISUAL OCCURRENCE RESULTING FROM SULFONAMIDE THERAPY

MESSRS. LUCIEN LEGER AND GUY OF-

FRET observed in a 13-year-old child, who had undergone sulfonamide treatment for a pneumonia complicated by pneumococcus peritonitis, a sudden blindness which completely disappeared in seven days. Examination of the fundus was always negative; the light reflex was retained, and there was no mydriasis. Cerebrospinal fluid was normal. The authors discussed the mechanism of this blindness without conclusion: cortical blindness, process of optic neuritis.

TWO UNPUBLISHED OBSERVATIONS OF  
SERIOUS FORMS OF OPTIC NEURITIS FROM  
AN ICTEROHEMORRHAGIC SPIROCHETOSIS

MR. AURENCHÉ presented these two observations which had this in common that they both left serious neuritic sequelae, a fact which goes counter to the classically accepted opinion on the benignity of the ocular complication from spirochetosis.

THESES PRESENTED BEFORE THE FACULTY  
OF MEDICINE OF PARIS

During this period of the war, the Faculty of Medicine maintained normal activity, although the number of students was continually decreasing. Courses and examinations followed their usual cycle and several theses on ophthalmology were presented, among which were:

ANDRÉ SENECHAL: CONTRIBUTION TO  
THE STUDY OF VISUAL TROUBLES FOLLOWING  
LOSS OF BLOOD. Paris, 1943

After a detailed clinical description, the author brings up the question of the origin of these visual troubles, the appearance of which, according to him, would be conditioned by three primary factors: a special region, a lesion or a local disturbance of the ocular apparatus, some releasing factor.

The special region is determined by an organic deficiency which can remain inde-

terminate, but in a large number of cases coincides either with an established hepatic insufficiency or with a noticeable disturbance of the functions of the liver. It would, then, be very interesting after such hemorrhages to investigate methodically the functional value of the liver.

But, in certain cases endocrine disturbances are encountered, among which the most notable and probably the most significant would be hormonal imbalance in connection with obesity.

Finally to mention one factor, sometimes associated with the preceding, there is a vago-sympathetic imbalance dependent on certain indications.

Local disturbances which seem to favor most the appearance of posthemorrhagic complications are: intraocular hypertension, a preëxisting lesion, a diminution of vascularization with spasm, a particular vulnerability of the sensory fibers.

The conclusive reason is really more complex than would appear on the surface. The hemorrhage seems to act not by the simple loss of a given quantity of oxygen, whose effects are known to be harmful and quasi-experimental, but by a more complex and deeper process; the possible action of heterogeneous substances accompanying a regeneration of blood, as witness the qualitative modifications of the blood. The visual apparatus is affected more often as the anemia is improved.

Every toxic substance—toxins secreted by gastric or duodenal ulcers, toxins from obesity, a superadded intoxication—is capable of engendering visual troubles, the substance having its harmful action increased along with the poor hepatic functioning.

DR. P. BREGEAT: CONTRIBUTION TO THE  
STUDY OF EARLY GLIOMAS OF THE OPTIC  
CHIASM. Paris, 1941.

This work, thoroughly documented, is based on the observation of 13 patients

whom the author was able to follow in the service of his chief, Prof. Clovis Vincent. These gliomas are rare tumors which arise in the young. Histologically benign, slow in development, loose or fibrous in structure, they are characterized by their Schwann-like aspect of which the oligodendrocytoma represents the purest type. Ophthalmologic symptoms are constant, particularly optic atrophy and disturbances in the visual field, but their modality of expression is variable. Symptoms of neurohypophysis are frequent, but at the same time few in number. Radiographic shadows are very frequent, but of unequal value. In the matter of glioma of the anterior optic pathway, pronounced dilatation of the optic foramen indicates an affection of the intracanalicular segment of the nerve; a gourd-shaped shadow indicates an attack on the intracranial segment. But it must be stated that the gourd-shaped shadow has less diagnostic value in this case than the dilatation of the optic foramen in the preceding case. Ventriculography permits at most only a diagnosis of neurosurgical localization. To sum up, no one sign alone is pathognomonic of a glioma of the chiasm; this explains the difficulty of its diagnosis.

There is a way of distinguishing two varieties of early glioma of the optic chiasm: (1) Clearcut cases which develop slowly in young children. The tumor infiltrates the anterior optic pathway, it follows its anatomic form, and breaks out at the third ventricle. (2) More frequent are the cases which change the shape of the chiasm, bloat it, have a tendency to invade the optic nerve and the third ventricle rapidly. It is in these forms that the disturbances of neurohypophysis often appear.

Diagnosis of early gliomas of the chiasm is an exceptional diagnosis, often an operative diagnosis. They are, in effect, generally confused with a tumor

which frequently occurs in children: the craniopharyngioma.

Neurosurgery has practically no effect on a glioma of the chiasm itself. Although often of diagnostic help, it is only a palliative; in getting rid of the intracranial hypertension, so frequently present, it makes possible a successful outcome with irradiation treatments.

DR. ALAIN GOERE: CONTRIBUTION TO THE STUDY OF BILATERAL TRAUMATIC PARALYSES OF THE SIXTH NERVE. Paris, 1943.

Treating a subject already well known, the author has attempted to set forth with great clarity the characteristic principles of these paralyses and to examine thoroughly certain points in their history. They result quite often from violent traumas causing a bilateral compression of the skull. Nevertheless, there are some cases in which shock has borne upon a point somewhere on the skull and has been only very light.

The two essential symptoms are: bilateral convergent strabismus and diplopia, which cause functional impotence of the two external recti.

In the majority of cases, as Panas thought, these paralyses are accompanied by fractures of the two petrous portions of the temporal bone. The close anatomic relations presented by the nerve and the bone at this point, make it possible to understand easily the mechanism of these paralyses; it seems most often to be a direct attack on the nerve by an osseous fragment, more rarely a compression by hematoma, osseous callous, or focus of osteitis. Goere admits the possible nuclear origin of these paralyses, particularly following traumatism which have brought about severe shock.

Prognosis is in general very poor when there is a fracture of the petrous portions of the temporal bone. It must, moreover,



be reserved for a long time, since it is possible for the lesions to be due to a constriction by hematoma, and in this case to regress. This pathogenesis occurs most often in the young child, who rarely sustains a fracture of the base of the skull. Consequently, prognosis will be better in his case than in that of an adult or aged person.

Surgical treatment alone can bring about improvement in the case of definitive bilateral paralyses. There should be a delay of about six months before surgical intervention is used. The author advises an advancement of the two external recti and, if necessary, a tenotomy of the two internal recti.

J. P. JOLY: MORPHOLOGY OF THE SENILE EYE. Paris, 1941.

The author of this thesis completes this chapter of ophthalmology by new knowledge, results of electric ophthalmoscopy and of biomicroscopy. The different parts of the eye do not age with the same rapidity, and the process of senility is expressed, according to the tissues, by various phenomena: sclerosis, cytologic changes, fatty or hyaline degenerations, proliferations of the conjunctiva, cellular atrophies. It is important to differentiate carefully between what arises simply from the physiology of old age and what is evidenced indubitably as pathologic in nature.

Proceeding step by step, organ by organ, Joly depicts successively the modifications of the adnexa, then the senile changes of the anterior and posterior segments of the globe.

In the paraorbital region, senile swelling of the upper lid contrasts with the adipose loss which invades other areas; and the wrinkles, the loss of eyebrows, the tendency to ectropion characterize the eyelids of the aged.

If the sclera becomes thick, the con-

junctiva, on the other hand, shows evidence of increased laxity. Fragile, it tears under the forceps which grasp it in the course of ocular operations. These sclerosed vessels can break, giving rise to small hemorrhages visible under the microscope. The cornea shows one of the most classic signs associated with age: arcus senilis or gerontoxon. Many adults of from 35 to 50 years of age, however, often manifest this incompletely. Involving the whole cornea, it extends to the deeper rather than the superficial layers, and is noticed as a deposit of cholesterine. But more interesting still are the disturbances discoverable with the biomicroscope in the transparent senile cornea, on superficial examination. Verucosities described by Hassal and Henle fill the posterior surface of the cornea. The endothelium loses its limpidness and colored lines are visible in the parenchyma. The depth of the anterior chamber is more often diminished rather than increased. Narrowed, the pupil does not lend itself well to ophthalmoscopic examination. It is the result of senile, iridic atrophy with progressive loss of pigment of the posterior epithelium. There is the same development in the ciliary body toward perivascular sclerosis with muscular atrophy. But the modifications of the crystalline lens especially invite attention. Internal dispersion increases, giving to the crystalline lens a grayish appearance which could be mistaken for a cataract without an examination by transillumination. At their extremity the branches of division of the sutures are bifurcated. The thickness of the cortex increases similarly to that of a nucleus.

According to the distinction, now classic since the report of Duverger and Velter, stationary, crystallinelike opacities must not be confused with a cataract, progressive opacification of the crystalline lens. Use of the slitlamp makes it

possible to determine all the changes that age adds to the previous affliction, to the nucleus and to the zones of discontinuity. Also, it sometimes leads to a lamellar dissociation, but the microscope does not seem to offer indisputable proof that the cataract according to the physiologic term could be attributed to senescence of the crystalline lens.

In the region of the posterior segment, explorable only after pupillary dilatation, the vitreous loses its transparency. A senile halo surrounds the papilla and obliterates its contours. Small yellowish spots, described by Nagel under the name of hyaline verrucosities of the vitreous layer of the choroid, are interspersed throughout the fundus; these are of no pathologic significance. On the other hand, the macula is sometimes the site of a true senile degeneration, result of circulatory insufficiency and lack of nutrition. The aspect of the vessels proves this: irregular, sinuous, sometimes sheathed with white.

In every way, so Joly concludes, these senile changes come on depending upon the individual, at a more or less advanced age, and certain elements of the globe age before others. Above all it is advisable not to consider as a pathologic lesion that which is only the prerogative, most often very tolerable, of age.

Such is the balance sheet of the ophthalmologic work and publications done during the German occupation of Paris. It is not complete, but such as could be determined, it suffices as a witness of the activity of ophthalmologists in Paris who in spite of the severity of the times have sustained their interest in work and in scientific research. Finally, it is fair to mention the participation of our provincial confrères who, struggling under difficulties, sometimes even greater, have brought forth interesting works gathered together with gratitude by the Parisian societies.

*154, Boul. Hausmann (8).*

# TRAUMATIC OCULAR INJURIES IN SOLDIERS\*

## PRELIMINARY STUDY

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This is a preliminary study of soldiers' eyes injured in combat and in training. The Army Institute of Pathology has received 399 eyes enucleated at army hospitals because of injuries sustained between the attack on Pearl Harbor (December 7, 1941) and D Day (June 6, 1944), the time we have chosen for the purpose of

plosives. Personal fights occur in training camps as they do in civilian life and accounted for 30 injuries. Baseball and other sports were responsible for 11 cases, while the origin of 46 is unknown.

An analysis of the time interval elapsing between injury and enucleation is of interest both clinically and pathologically. The severely injured eyes were removed by necessity within the first few days. In the majority of cases, however, enucleation was delayed from two weeks to four months, while all surgical, physical, and chemical methods of therapy were utilized in the attempt to save the eye and salvage useful vision. To the pathologist this time interval is important, as it makes possible the study of the reparative processes in injured eyes at all stages.

TABLE 1  
CAUSES OF OCULAR INJURIES

Wounded in action .....	56
Wounds received in training camps	
Explosions, accidental	
Land mines .....	41
Cartridges, dynamite, grenades, percussion caps, shrapnel, gunshot .....	92
Airplane, jeep, automobile, and motorcycle accidents .....	19
Nonexplosive penetrations	
Bayonet, rifle spring, etc. ....	14
Hammers, chisels, nails, wire and tools	48
Miscellaneous (glass, stone, wood, etc.)	42
Fights .....	30
Baseball and other sports .....	11
Injuries of unknown origin .....	46
Total .....	399

this paper. In later studies we shall deal with the eyes injured from D Day until the termination of the war, and in more detail, with various phases of injuries.

The patients were all soldiers who were in the 18- to 38-year age group. The lesions in 56 of this series were the result of battle wounds (14 percent), and in all these explosions were the injuring agents. In 256 cases the injuries were incurred in training for combat (64.2 percent), and included 133 due to high ex-

TABLE 2

TIME INTERVAL BETWEEN INJURY AND  
ENUCLEATION

Time After Injury	Number of Cases
Same day .....	40
2d day .....	15
3d day .....	12
4th day .....	9
5th day .....	9
6th day .....	6
7th day .....	21
2d week .....	48
3d week .....	30
4th week .....	13
2d month .....	62
3d month .....	27
4th month .....	26
5th month .....	18
6th month .....	10
6 months to 1 year .....	21
Over 1 year .....	3
Unknown .....	29
Total .....	399

\*From the Army Institute of Pathology, Col. J. E. Ash, Director. Read before the New York Academy of Medicine, Section of Ophthalmology, February 19, 1945.

In this series there were 373 eyes with penetrating wounds. Laceration was extensive in 10 cases. The cornea was the site of penetration in 147, the sclera in 87, whereas a combined corneoscleral penetration was present in 94. In 35 the site of penetration was unspecified and could not be determined from examination of the globe.

Foreign bodies caused many of the penetrating wounds of the globe. Attempts to remove the foreign bodies were made whenever their presence was suspected. In this series there were 28 successful removals of intraocular foreign bodies, 7 being extracted on the day of injury. In 33 cases, however, the foreign bodies were

TABLE 3  
SITES OF PENETRATING WOUNDS

Cornea.....	147
Limbus (including cornea and sclera).....	94
Sclera.....	87
Extensive laceration.....	10
Unspecified.....	35
Total.....	373

nonmagnetic and could not be removed. On pathologic examination many foreign bodies were discovered that had not been suspected clinically, or else that were in eyes so disrupted that enucleation was imperative. These retained foreign bodies were metallic in 57 instances, whereas 22 were of a miscellany of nonmetallic substances. In 45 cases the nature of the foreign bodies has as yet remained undetermined.

Operative attempts to save the eye were made in 86 cases. A simple repair of the wound without excision of tissue was done in 33 cases, whereas in 28 others, repair with excision of prolapsed tissue was carried out. Traumatic cataracts were extracted from 14 eyes. Secondary glaucoma required operation in 7 cases, and in 4 iridectomy was performed for various reasons.

TABLE 4  
ATTEMPTS AT REMOVAL OF INTRAOCULAR FOREIGN BODIES

Outcome	Day of Operation	
Successful	Same.....	7
	2d.....	2
	3d.....	1
	4th.....	1
	7th.....	1
	9th.....	2
	18th.....	1
	Unspecified.....	13
Total.....		28
Unsuccessful.....		33

Examination of the enucleated globes showed a wide variety both of tissue injury and of the mechanism of repair. The penetrating wounds resulted in prolapse and incarceration of all the intraocular structures, separately and in combinations. The commonest type of prolapse was that of the iris, with that of the combined iris and ciliary body next in frequency. Penetration of the posterior segment of the globe produced combined prolapse of the uvea, retina, and vitreous. Extensive evisceration of the contents of the globe was encountered in 48 eyes, and in 25 the lens was extruded through the site of injury. Detachments of the retina, some in combination with those of the uveal tract, were found in about one half of the 373 eyes with penetrating wounds. Intraocular hemorrhages were the commonest findings; they were seen in all the tissues, in various stages of resorption and organization. The most frequent single structural change was traumatic cataract, present in 190 eyes. Inflammatory changes were very common,

TABLE 5  
OPERATIVE ATTEMPTS OTHER THAN FOR FOREIGN BODY

Simple repair—no excision.....	33
Repair with excision of prolapsed tissue.....	28
Removal of traumatic cataract.....	14
Operations to lower intraocular pressure.....	7
Iridectomy.....	4

TABLE 6  
PENETRATING WOUNDS—PATHOLOGIC  
FINDINGS (373 EYES)

Prolapses	
Iris.....	74
Ciliary body.....	8
Combined iris and ciliary body.....	32
Combined viscera.....	20
Extensive evisceration.....	48
Lens extrusion.....	25
Detachments	
Retina.....	77
Uvea.....	15
Retina and uvea.....	76
Intraocular hemorrhage.....	290
Traumatic cataract.....	190
Inflammations	
Acute.....	66
Subacute.....	33
Chronic.....	145
Secondary glaucoma.....	25
Phthisis bulbi.....	44
Siderosis bulbi.....	3

being acute in 66 cases, subacute in 33, and chronic in 145. Secondary glaucoma was a complication in 25 eyes, and beginning and advanced phthisis bulbi in 44. It is noteworthy that of 57 cases in which retained metallic foreign bodies were found on sectioning the eyes, in only 3 was there histologic evidence of siderosis bulbi. Even more worthy of emphasis is that in this series of 373 penetrating wounds, there was not a single instance of sympathetic ophthalmia.

There were also in this series 26 eyes with nonpenetrating or contusion types of injury. Here also the commonest change was hemorrhage. Traumatic cataract was present in 10 cases, with detachment of the retina and uvea in 31 percent of the series, as compared to 45 percent in the penetrating injuries. It is apparent in the tables that phthisis bulbi was a more frequent sequel to penetrating

injuries (12 percent), and secondary glaucoma to contusions (38 percent). Inflammatory changes were present in 66 percent of the penetrating injuries and in 50 percent of the contusions.

TABLE 7  
CONTUSIONS—PATHOLOGIC FINDINGS  
(26 EYES)

Iridodialysis.....	3
Rupture of iris and filtration angle.....	2
Dislocated lens.....	1
Traumatic cataract.....	10
Intraocular hemorrhage.....	20
Anterior chamber.....	6
Detachments	
Retina.....	6
Uvea and retina.....	2
Inflammations	
Acute.....	2
Subacute.....	2
Chronic.....	9
Secondary glaucoma.....	10
Phthisis bulbi.....	2
Evulsion of optic nerve.....	1

This initial overall picture of ocular injuries in soldiers is simply a statistical report. Analysis, interpretation and clinical correlation will be attempted in the studies now under way. It is our purpose to study in detail the histologic reactions to intraocular foreign bodies, the types of injury sustained in nonpenetrating contusions, the mechanism of repair in the various ocular structures, the fate of hemorrhage in the eye, and late degenerative ocular changes following injury.

Again, we wish to call attention to the absence of sympathetic ophthalmia in these cases. Great credit is due the ophthalmologists of the Army Medical Corps who have handled so many cases so skillfully.

1610 Eye Street.

# CHANGES AT THE MACULA DUE TO SOLAR RADIATION

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*Toronto, Ontario*

This paper presents seven cases of injury to the macula in individuals who have viewed an eclipse. The injuries were found in young, healthy men of the R.C.A.F. in the course of 1,000 routine eye examinations. In all cases the exposure to solar radiation had occurred several years previously, and the subjects now noted only minor abnormalities of vision.

Special methods of examination were required for the investigation of the very small central scotoma and the minute changes at the macula. The other findings were obtained by means of routine ophthalmologic techniques.

## METHODS OF EXAMINATION

### A. VISUAL FIELDS

The very small central scotoma was investigated by two methods, as follows:

(1) The tangent screen was used at from 2 to 5 meters. Plotting was done with a white test object of from 1 to 5 mm. If this failed to reveal the defect a blue test object was substituted. The patient's correction was worn over the eye to be tested while the other eye was covered. The examiner obtained fixation by placing four small white objects as if to mark the ends of a cross and asking the patient to fixate at the center of the cross. When the distance was 2 meters the fixation objects were first set 5 cm. apart. The scotoma was plotted roughly, and the fixation objects brought in close to the margins of the defect. The outline of the scotoma could then be traced accurately.

The main problem is to maintain steady fixation. Since central vision is defective, a single fixation object allows fixation to

wander. However, when four objects are used and brought to the margin of the defect, fixation can be steady and the defect plotted accurately between them. A long working distance increases the size of the scotoma but decreases the steadiness of fixation.<sup>1</sup> However, in these cases the longer distances have seemed to give better results. When a constant defect cannot be found, it is probable that fixation has been sufficiently unsteady for a very small scotoma to appear to shift. In such a case the patient loses the test object for a moment and then sees it again without the examiner's being able to localize the visual defect at any one point.

(2) The tangent screen was used at from 2 to 4 meters, and a single white 5-mm. fixation object was placed at the middle of the lower part of the screen. A trial frame was set on the subject's face with a 20-diopter prism, base down, and a pinhole disc over the sound eye. The patient's correction was put over the eye to be tested. The examiner obtained fixation by requesting the patient to view the fixation object through the pinhole disc and prism with the sound eye. By this means the fixating eye saw a dim image of the fixation object displaced upwards. The subject was asked to look at the dim image, and this caused the injured eye to be aligned on a point above the fixation object. The region of this point was not visible to the fixating eye because of the pinhole disc. The projected fixation object was charted and the whole neighboring region investigated for a scotoma. Fixation was so steady that a small scotoma could easily be found and the borders accurately traced. This method could be employed when one eye was affected.

## B. OPHTHALMOSCOPIC EXAMINATION OF THE MACULA

The optics of the normal foveal reflex have been described by Friedenwald.<sup>2</sup> The macula is comparable to a concave mirror. Light from any source, as from an oph-

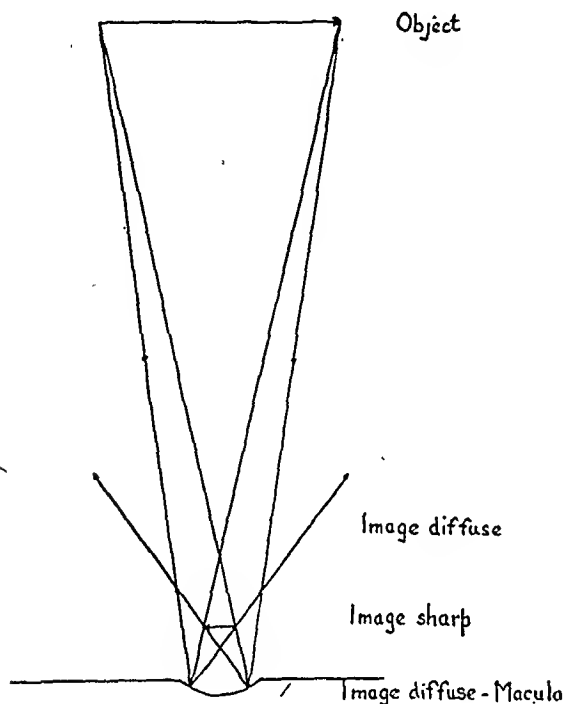


Fig. 1 (McCulloch). Size of diffusion circle in the macular area.

thalmoscope, is reflected to show a real, inverted image in front of the macula. This is illustrated by figure 1. With the ophthalmoscope light representing the object, the image lies just in front of the macula. By changing the lens in the ophthalmoscope head it is possible to view the reflected light either at the surface of the retina, at the point of formation of the image, or in front of this point. When the fundus at the macula is brought into accurate focus the foveal reflex is found to appear as a rounded, diffuse spot of light. If +2D. is then turned up in the ophthalmoscope head, a brilliant pin-point spot of light is seen. If an additional

+2D. is used, the foveal reflex again becomes diffuse.

The foveal reflex is an inverted real image of the light source. If the object is moved in one direction, the image moves in the opposite. This is illustrated in figure 2; when the object is moved in the direction of the object arrow, the image moves in the direction of the image arrow. Therefore, if the ophthalmoscope is moved across the dilated pupil while the examiner is viewing the macula, the foveal reflex is seen to move in the opposite direction.

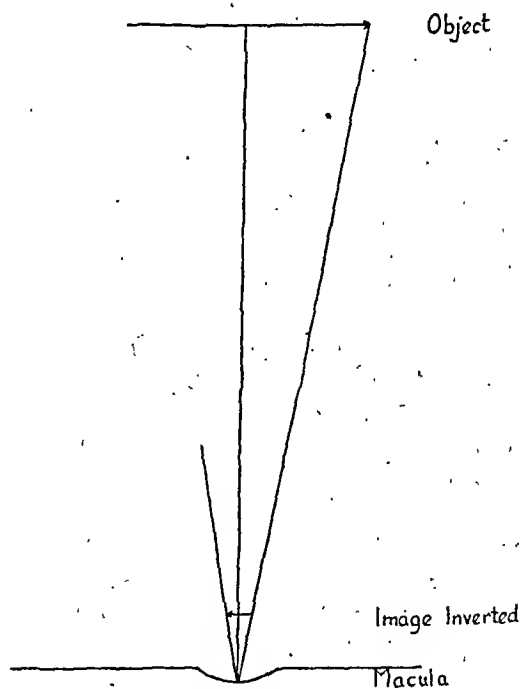


Fig. 2 (McCulloch). Formation of "against movement" at the macula.

## CASE REPORTS

CASE 1. A. H., a man aged 20 years, had viewed an eclipse as a boy; since then the vision of his right eye had been poor.

Vision. O.D. 20/60; O.S. 20/50. Right eye dominant.

Homatropine acceptance. O.D. -1.00D.

sph.  $\approx$  +0.50D. cyl. ax.  $90^\circ$  = 20/30. P.H. unimproved. O.S. -0.50D. sph.  $\approx$  +0.50D. cyl. ax.  $75^\circ$  = 20/20.

*Fields.* A small central scotoma, 2 cm. across, test object 4/2,000 blue, right eye.

*Fundus.* The macula of the right eye showed three yellow spots which did not move and had surrounding dark rings. The normal reflex was missing.

CASE 2. A. J. S., a man aged 29 years, had viewed an eclipse eight years ago. Since then the vision of his right eye has been poor, and small objects have seemed deformed.

*Vision.* O.D. 20/25; O.S. 20/20. Right eye dominant.

*Postcycloplegic acceptance.* O.D. +1.00 D. sph. = 20/25. P.H. unimproved. O.S. +1.50D. sph.  $\approx$  +0.50D. cyl. ax.  $90^\circ$  = 20/20.

*Fields.* Central, thin crescent-shaped scotoma, 2 cm. long; test object 3/2,000 white, right eye.

*Fundus.* At the macula, right eye, was an immovable yellow spot, with a surrounding dark, "pebbled" area. The normal reflex was also present.

CASE 3. A. N. O., a man aged 21 years, had had poor vision since viewing an eclipse about eight years ago.

*Vision.* O.D. 20/30; O.S. 20/30. Right eye dominant.

*Postcycloplegic acceptance.* O.D. +0.50 D. sph. = 20/30. P.H. unimproved. O.S. +0.50D. sph. = 20/30. P.H. unimproved.

*Fields.* Both eyes showed small central scotoma for a 3/2,000 white test object.

*Fundus.* The macula of the right eye showed two, that of the left one, immovable yellow spots surrounded by dark rings. There were no normal reflexes.

CASE 4. J. C. P. M., a man aged 23 years, about nine years ago had viewed an

eclipse. Since then the vision of the right eye had not been so good as that of the left.

*Vision.* O.D. 20/30; O.S. 20/20. Right eye dominant.

*Postcycloplegic acceptance.* O.D. +1.00 D. sph.  $\approx$  +0.75D. cyl. ax.  $105^\circ$  = 20/20. O.S. +1.00D. sph.  $\approx$  +0.25D. cyl. ax.  $105^\circ$  = 20/20.

*Fields.* Small central scotoma, test object 3/1,000 blue, right eye.

*Fundus.* The macula in the right eye was dark and the reflex did not move nor change with the lens in the ophthalmoscope head.

CASE 5. J. E. P., a man aged 27 years, had viewed an eclipse seven years ago. Since then the vision of his right eye had been poor.

*Vision.* O.D. 20/50; O.S. 20/20. Right eye dominant.

*Homatropine acceptance.* O.D. +0.25 D. sph.  $\approx$  +0.25D. cyl. ax.  $105^\circ$  = 20/40. P.H. Unimproved. O.S. +0.25D. sph.  $\approx$  +0.50D. cyl. ax.  $67^\circ$  = 20/20.

*Fields.* Narrow crescentic central scotoma, 2 cm. long, test object 3/2,000 blue, right eye.

*Fundus.* In the right eye the lower part of the macula showed a yellow spot which did not move and was surrounded by a dark ring. Above this could be seen the normal foveal reflex, the lower part of which, near the yellow spot, was defective.

CASE 6. N. T. G., a man aged 21 years, since viewing an eclipse eight years ago, had had poor vision with his right eye.

*Vision.* O.D. 20/40; O.S. 20/20. Right eye dominant.

*Postcycloplegic acceptance.* O.D. -0.25 D. sph.  $\approx$  +0.25D. cyl. ax.  $90^\circ$  = 20/30. P.H. unimproved. O.S. +0.25D. cyl. ax.  $90^\circ$  = 20/20.

*Fields.* Small central scotoma, 2 cm.



across, test object 3/2,000 white, right eye.

*Fundus.* The macula of the right eye showed a small central yellow spot which did not move and was surrounded by a dark ring having a pebbled appearance. There was no normal reflex.

CASE 7. J. C. G., a man aged 21 years, about seven years ago had viewed an eclipse. This dazzled him at the time, but he had not noted anything remarkable about the vision of either eye since then.

*Vision.* O.D. 20/30; O.S. 20/20. Left eye dominant.

*Postcycloplegic acceptance.* O.D. +0.75 D. sph.  $\Rightarrow$  +0.50D. cyl. ax.  $75^\circ = 20/30$ . P.H. unimproved. O.S. +0.50D. sph.  $\Rightarrow$  +0.25D. cyl. ax.  $80^\circ = 20/20$ .

*Fields.* No field defect was found in the right eye, but the patient described seeing letters on the 20/20 line of the Snellen chart only when he looked at neighboring letters.

*Fundus.* The macula of the right eye showed a yellow immovable spot with a dark ring around it. There was no normal reflex.

#### SUBJECTIVE SIGNS AND SYMPTOMS.

Six of the seven men in this series gave a history of reduced visual acuity in one or both eyes since viewing the sun or an eclipse of the sun.

The subjective signs vary. The patient may recall viewing an eclipse but not remember if his poor vision dated from that time. He may state that his vision has been poor since a certain year. Inquiry may then reveal that an eclipse of the sun occurred where he was living at that time.<sup>3</sup> However, some cannot remember how long the vision has been poor or do not even know that acuity is reduced in one eye.

The patient may complain of a central defect in his vision. This is due to a sco-

toma which is very small, exactly at the fixation point, and negative. He realizes that there is a hole in his vision because when he looks directly at a small object he cannot see it. If he looks to one side of the object, it comes into view. This symptom is present when both eyes are damaged or if the dominant eye only is affected. If the injury occurs in the non-dominant eye, the scotoma may not be noticed, as in case 7.

The patient may recognize other changes in his vision. Objects in the central field may appear smaller or larger than normal, blurred, shifted, or twisted in position. This is particularly noticeable when the patient looks at the smaller letters of the Snellen chart.

Even without reduced acuity, the patient may discover a small central scotoma. He finds that the defect in his vision is just to one side of the fixation point, and although acuity is not affected he realizes something is wrong with the vision of that eye.

#### FINDINGS

1. *Acuity.* Six of the seven patients showed a not-correctable lowered visual acuity ranging from 20/25 to 20/40. In the other case vision was 20/20, although a small central scotoma was found.

2. *Fields.* Six patients showed a small central scotoma which was either relative or absolute, more frequently the former. It was always negative. It was very small, in four cases recorded as measuring 2 cm. across .2 meters. In two cases the scotoma was crescentic in shape, the length of the crescent being 2 cm. at 2 meters. One patient had no field defect but he noted a "hole" in his vision when looking at the 20/20 line of the Snellen chart. The ring scotoma as discussed by Loewenstein and Steel<sup>4</sup> has not been found in the present group of cases.

3. *Fundus*. In all cases the ophthalmoscopic appearance of the macula presented several characteristic features. These and variations for particular cases will be described in detail.

The foveal reflex was replaced by a bright red or yellowish spot at the center of the macula. This spot appeared sharp when accurate focus was made at the surface of the retina. As the focus was moved forward into the vitreous the spot became diffuse in appearance. It was steady and did not show the against movement which is normal for the macular reflex. When the spot was small, as in case 4, these two findings were all that differentiated it from the normal reflex. The size of the spot varied up to the diameter of one of the main retinal veins. Its shape was oval or round except in case 5, in which it had a crescentic appearance. Three yellow spots were seen in the macula of the right eye in case 1 and two in case 4. If the spot was large enough, its border could be seen to present a jagged outline.

In case 5 it was possible to see that the lesion lay just below the normal fovea. The lower part of the foveal reflex was irregular and defective, whereas the upper part was normal. In case 2 the normal foveal reflex and the abnormal yellow spot were both present. The abnormal spot was situated at the center and behind the normal reflex, was steady, and became continuously more hazy as focus was advanced into the vitreous. It did not show side-to-side movement but appeared separated from the normal reflex whenever the ophthalmoscope was moved.

In all cases the immediate neighborhood of the yellow spot presented a dark, irregular, "pebbled" appearance. This irregularity was either diffuse, quickly shading off into the surrounding fundus, or formed into short lines radiating from the central spot. If the lesion was large,

this dark area was pronounced and suggested the aggregation of pigment about the defect. In the six cases in which one eye only was affected, the two maculas were compared and the difference between the normal and the abnormal was very striking. Under red-free light the difference was even more noticeable.<sup>5</sup> No cystic changes were found in the retina about the macula by Reese's retroillumination test.<sup>6</sup>

4. *Color vision*. Color vision, as tested by the Ishihara book and the American Optical Company plates, was normal in all seven cases.

5. *Dominance*. In six cases the lesion occurred in the right eye. In the other case it occurred in both eyes. Of the six cases, four showed right-eyed dominance, one left-eyed dominance, and in one the dominance was not recorded. The patient with the dominant left eye had not noted any peculiarity of vision despite the poor visual acuity of the right eye. The dominance was not recorded in the case showing lesions at both maculas.

## DISCUSSION

In diagnosing this condition there are a number of causes for a hole or cyst at the macula other than solar radiation which must be considered. If a defect such as has been described is found, the history may indicate the correct etiology. If the history is negative, other etiologies such as congenital or hereditary changes, senile degeneration, lesions caused by toxic agents, and contusion injury cannot be ruled out.

Differentiation from tobacco-alcohol amblyopia should always be made. This amblyopia shows no change at the macula, and a larger central scotoma, more marked, or only brought out by red. If the vision is below 20/40 it can be presumed that damage at the macula is extensive and the yellowish spot and dark

ring should be large. In tobacco-alcohol amblyopia vision is often 20/40 without any accompanying change in the appearance of the macula.

Colloid excrescences of the lamina vitrea near or at the fovea have exactly the same appearance as the yellow spot due to solar radiation. The excrescences occur usually in older people, however, and do not necessarily show the surrounding dark ring, the decreased acuity, and the central scotoma.

The central defect may be confused with an area of suppression when the prism method of plotting is used. However, a suppression area is larger, shallower, variable in size, shape, and position, and tends to disappear when the test object is moved. The scotoma due to solar radiation is small, frequently has a characteristic slit shape, a definite border, is constant in position, and is present even when the test object is in motion.

Cases of lowered acuity due to snow blindness have not been seen, so that the necessity of differentiation from this entity has not arisen.

Other causes for decreased acuity, such as keratoconus, corneal nebulae, lens opacities, and congenitally defective eyeball accompanying inferior crescent can be ruled out in the course of the general eye examination.

Other authors report a greater lowering of acuity than has been noted in this series. Pittar,<sup>7</sup> Würdemann,<sup>8</sup> Harman and MacDonald,<sup>9</sup> and Lodge<sup>10</sup> had cases which were tested shortly after the injury. If these cases had been seen years later they might have shown better visual acuity. Birch-Hirschfeld's<sup>11</sup> cases showed a marked improvement with time. Damage to the macula from contusion is likely to be more extensive than that due to solar radiation, which would account for the greater lowering of acuity in contusion cases.<sup>12</sup> In the one case of this series

which did not show lowering of acuity, the damage must have been just off the most sensitive area of the macula.

The great preponderance of lesions in the dominant eye is probably related to the fact that most people, when viewing a bright object like the sun, narrow both palpebral fissures and close completely the nondominant eye first. Loewenstein and Steel<sup>4</sup> pointed out that an individual is likely to allow an eye with fundus disease to be overexposed to the sun. However, the great majority of cases occur in normal eyes.

Pittar's<sup>7</sup> report is of particular interest. Enemy planes attacking our positions prefer to fly "out of the sun." Our men when aiming their guns must look directly toward the sun and are therefore liable to macular and perimacular damage. Such cases will probably be seen in all stages, from the reception of the injury to the final result. The cases described here represent only the residual damage.

As all the present cases were drawn from young men in the R.C.A.F., the age and sex distribution can be of no significance.

Verhoeff, Bell, and Walker<sup>13</sup> have stated that the changes at the macula due to solar radiation are due to damage from heat. The lens of the eye focuses the rays from the sun on the retina. At the pigment epithelium these rays, of many wave lengths, are absorbed, producing heat which damages the neighboring structures. The rays from the sun's corona are about as strong as those from the moon.<sup>14</sup> Damage must therefore be due to the subject's examining the sun's disc, either partially or not at all occluded, and not to rays from the corona. The crescent-shaped scotomas obtained in this series measured about 2 cm. in length at 2 meters. This represents about 30 minutes, which is the same angle as that subtended by the sun. Similarly sized scotomas were

found by Klang.<sup>15</sup> These scotomas may represent images of partial eclipses burnt in the pigment epithelium. Dimmer<sup>16</sup> suggested, however, that the crescent-shaped figures he saw at the macula might represent the path of damage as fixation moved during the viewing of the eclipse. This explanation could hardly account for the small scotomas found in the present series, for to fulfill Dimmer's hypothesis they would have needed to be at least larger than the angle subtended by the sun's diameter.

The pathologic changes at the macula caused by solar radiation have not been adequately described. Coats and others<sup>17</sup> have outlined in detail the changes that occur in connection with a hole at the macula due to other causes. He describes cystic spaces in the retina which, when sufficiently large, form a hole. A small amount of fluid may be present under the macula and adjacent retina, and the pigment epithelium may show atrophic changes. The appearance of the lesion following trauma and that following solar radiation are somewhat similar.

Greeves<sup>18</sup> has suggested that holes at the macula from various etiologies might be assumed to be comparable. However, there are several particulars about changes at the macula due to solar radiation that indicate changes due to this cause may have their own peculiarities. The central yellow spot in the cases herewith described is very small. In no instance is it as large as some of the holes at the macula described in the literature.<sup>19</sup> The surrounding "pebbled" and "darkened" area is characteristic. It is as constantly present as the central yellow spot, whereas a "pebbled" ring is not always seen surrounding a hole due to other causes. Würdemann<sup>8</sup> has described the possible changes following macular damage from the flash of an electric arc. He described a central hole, surrounded by a darkened

area. His case was seen shortly after exposure, and he ascribed the dark area to a local hemorrhage under the macula. The dark ring which is seen in the present cases may be due to such a hemorrhage which has become partially absorbed. Pigment aggregation in the underlying choroid, local proliferation of pigment epithelium, or dispersion of pigment into the retina might all produce such an appearance. The clearness of the dark ring suggests that it at least does not lie outside the pigment epithelium. Finally, if cystic changes occur at the macula neighboring a hole, an optical situation could possibly be set up which would produce this darkened appearance. However, in this series no such changes were found.

Though several pathologic changes may be possible, one in particular seems likely. Verhoeff, Bell, and Walker<sup>13</sup> point out that the retina absorbs very little light but the rays pass through to be absorbed at the pigment epithelium. Most of the heat produced would be at that position. We would therefore expect the pathologic changes to center at the pigment epithelium.<sup>20</sup> The dark ring seen about the yellowish spot is probably due to an aggregation of pigment about a burnt-out hole in the pigment epithelium. Such a change, located at the pigment epithelium, would be different from that of a hole of the macula due to a blow or toxic agent which primarily affects the retina and not the pigment epithelium.

#### SUMMARY

Seven cases of residual change at the macula probably due to solar radiation have been reported.

1. A method for plotting very small central scotomas with the tangent screen, and a method for noting the properties of the normal macular reflex, were described.

2. A small central scotoma was found

in six of the seven cases.

3. The fundi in all seven cases showed an abnormal yellow spot at the macula, surrounded by a dark ring.

4. In six of the seven cases the lesion was in the right eye. Four of these cases were right-eye dominant, one left-eye dominant, and in one the dominance was not recorded.

In the discussion it was pointed out (1) that other causes for cyst at the macula must be considered, and the con-

dition differentiated from tobacco-alcohol amblyopia, colloid excrescences, and suppression areas when doing scotometry; and (2) that the pathologic change at the macula probably centered at the level of the pigment epithelium and not at the level of the retina.

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# CAUSES OF FAILURE IN THE TREATMENT OF SQUINT\*

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The problem of treating squint has many phases, the success of each markedly influencing the management of the others. Treatment consists of accurate diagnosis, refraction and glasses, treatment of amblyopia, preoperative orthoptics, surgery, and postoperative orthoptics. Obviously, if poor diagnostic methods are used, or inaccurate deductions made from the diagnostic findings, all the rest of the treatment will be more difficult or impossible. The same will be true about improper glasses, inadequate treatment of amblyopia, lack of orthoptic aid, or improper surgery. Success can come only from intelligent integration of all these steps. Another factor adding to the difficulty of treating squint is the relative lack of accurate statistics in many of the series reported, and the widely variable final results which would seem satisfactory to different observers. There are those who are satisfied when the patient or parents are pleased. Others are satisfied with a residual squint of a given measurable amount, whereas the "purists" would be satisfied with nothing less than two straight eyes, seeing well together.

## STANDARDS OF "CURES"

Squint "cures" must be defined and qualified better than has been done to date. In 1939, the British orthoptists<sup>1</sup> suggested a standard of cure, but did not allow for partial cures or grades of cures. I should like to suggest four classes or grades of "cure." The *first* would correspond very closely to the standards set up by the British—that is, straight eyes,

normal vergences, good fusion and stereopsis carried into reading and other daily visual tasks. The *second* would leave the patient with a small heterophoria, having good fusion and stereopsis on the synoptophore, but varying from fusion to diplopia on the red glass and Worth 4-dot test, and with an inconstant ability to bar read. The *third* would leave the patient with a small heterotropia and fair vision, only fair fusion on instruments, and little fusion carried into daily tasks. The *fourth* would leave a heterotropia of small degree, but with no fusion or visual requirements—a cosmetic "cure" alone.

With standards similar to these, cures could be properly graded and qualified in the future. It is manifestly impossible to achieve a grade-1 cure in all cases, but that need not discourage the ophthalmologist and orthoptist from trying to get a less perfect grade of correction.

## CAUSES OF FAILURE

In a brief review of certain recent writings, the following comments were found bearing on the causes for failure in the treatment of squint. Feldman<sup>2</sup> listed the obstacles to squint training as: 1. suppression, 2. amblyopia, 3. abnormal retinal correspondence, and 4. vertical imbalance. Hitz<sup>3</sup> listed the problems in treatment of squint as: 1. fixed abnormal retinal correspondence, 2. marked anisometropia, 3. aniseikonia, and 4. variable vertical imbalance not limited to a single muscle. Allen<sup>4</sup> listed: 1. abnormal retinal correspondence, 2. amblyopia, and 3. combining surgery of vertically and laterally acting muscles in a single operation. Dunnington and Wheeler<sup>5</sup> suggested: 1. improper preoperative analysis, 2. variability

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in size, strength, and insertion of muscles, and 3. the difficulty in determining the exact amount of lengthening or shortening done, as factors in the lack of success in surgery of squint. They found that alternating convergent squint, and squint in patients between three and eight years of age, gave the largest percentages of poor results. Grant,<sup>6</sup> in discussing their analysis, stated that alternating esotropia, and esotropia of the convergence excess type, were especially difficult to handle. Davis<sup>7</sup> thought that surgical failure was due to: 1. improper preoperative diagnosis, and 2. improperly performed, or poorly conceived surgery. Fralick,<sup>8</sup> and White and Brown<sup>9</sup> emphasized the difficulties encountered in treating the combined vertical and lateral squints. Ellett, Rychener, and Robinson<sup>10</sup> found failures greater when amblyopia or abnormal retinal correspondence persisted. Berens, Elliott, and Sobacke<sup>11</sup> in 1941, and Bressler<sup>12</sup> in 1936, in analyzing series combining surgery and orthoptics, found over- and undercorrection much greater when no orthoptic training had been given. Mrs. Adler<sup>13</sup> listed: 1. prolonged esotropia with vertical imbalance, 2. macular suppression, and 3. persisting poor fusion in cured amblyopia, as conditions causing difficulty in treating squint. Miss Lancaster<sup>14</sup> suggested: 1. suppression, 2. abnormal retinal correspondence, 3. failure to get amplitude, 4. failure to convert laboratory fusion skills to daily needs, and 5. failure to arouse active rather than passive response from patient as chief stumbling blocks to orthoptic success.

It would seem, then, that lack of success in the treatment of strabismus may be due to diagnostic ineptitude or error, or to failure to apply recognized principles and technique to treatment of the visual, orthoptic, and surgical problems at hand. A further analysis of these de-

ficiencies should be helpful.

#### VISUAL AND REFRACTIVE

When the visual and refractive sources of failure are considered only a word or two are necessary to discuss ocular disease, refractive error, and anisometropia.

Often opacity of the lens, or evidence of past inflammation of the central retina or optic nerve, each of which should be apparent when the eye is examined with a mydriatic, would seem to preclude binocular vision. The examiner must not lose sight of the fact, however, that the visual loss may be due in small part only to the obvious disease, whereas the overlying amblyopia ex anopsia resulting from the disease causes the greater loss. I recall many such cases in which I expected little visual improvement, but was pleasantly surprised with the result of adequate occlusion.

I call your attention again to two comments of Hitz.<sup>3</sup> He among others states that marked anisometropia is probably a bar to single binocular vision. This is undoubtedly true in spite of an occasional case to the contrary. Hitz, in discussing also the role of accommodation in squint, urged that refraction be *repeated* at least once before surgery, to assure complete relaxation of accommodation, and thus avoid surgery on an eye with purely accommodative squint. Davis,<sup>7</sup> in his numerous writings, has repeatedly emphasized the error of performing any surgery on an eye with such a squint. These cases should be treated by glasses and orthoptics alone. I have had two patients for a number of years, whose eyes when not accommodating are divergent, and when accommodating are convergent. These were cases of pure accommodation, wherein the medial recti were ill advisedly recessed.

The chief visual cause of failure in the treatment of squint has been the failure

to recognize amblyopia ex anopsia as such, and the failure to treat it adequately when recognized. Fortunately, there are only a few ophthalmologists who find a very high percentage of so-called "congenital" amblyopia among their patients. I need hardly say that congenital amblyopia is best diagnosed by exclusion, after adequate treatment for amblyopia has been given.

Amblyopia ex anopsia is mentioned as a prominent cause for failure in squint treatment by Allen,<sup>4</sup> Ellett, Rychener, and Robinson,<sup>10</sup> Dunnington and Wheeler,<sup>5</sup> Yoxall,<sup>15</sup> Stringer,<sup>16</sup> Dicke,<sup>17</sup> Feldman,<sup>18</sup> and Hitz,<sup>3</sup> to mention just a few writers. Dunnington and Wheeler found it in 50 percent of their series of 211 cases, and Feldman in 42 per cent of his private cases and in 55 percent of his clinic cases. Other writers have found amblyopia ex anopsia present in about 50 percent of their cases.

When considering the treatment of such amblyopia, it is apparent that in spite of the overwhelming evidence and opinions in favor of constant and complete occlusion,<sup>4,5,7,8,13,15</sup> failure is frequently due to "too little and too late" occlusion. I have been inclined to believe that total occlusion only is worthwhile but that satisfactory, stable return of vision is not probable after the age of eight years (of course, depending somewhat on the age of onset and on the vision at the beginning of treatment). I feel that if there is no central fixation after two to four weeks, or no definite improvement in vision after three months of complete occlusion, further treatment of vision is not justified. Hitz believes that central vision should return in one to two weeks. Feldman suggests that six months of occlusion offer a fair trial for visual improvement. On the other hand, Yoxall,<sup>15</sup> using total occlusion up to 19 months, obtained central fixation in 41 of

42 cases, and equal vision in the two eyes of many up to the age of 12 years, by occluding for additional months. Stringer,<sup>16</sup> by constant occlusion for a period up to 12 months in 150 patients, obtained central fixation in 92, and equal vision in 66. It is evident, then, that whereas some (especially the British orthoptists) would occlude longer than others, constant occlusion for an average of three to six months should be attempted before failure is conceded. Allen stressed the importance also of macular and bimacular stimulation as well as occlusion, as being essential to good treatment of amblyopia ex anopsia. When a final vision has been attained, Ellett and his associates<sup>10</sup> felt that an acuity of less than 6/12 precluded 3d-degree fusion, and this would lead to failure in the functional cure of the squint.

In the light of these findings it would seem that inadequate and belated occlusion, allowing amblyopia to persist, and possibly high degrees of anisometropia, are the chief visual causes of failure in the treatment of squint.

#### BINOCULAR VISION (ORTHOPTICS)

The visual relationship of the eyes is most important to the success or failure of squint treatment. The simple improving of vision by refraction and occlusion and the straightening of eyes by surgery may do little or nothing toward aiding the two eyes to see together correctly. Functional cure must be actively sought after cosmetic "cure" has been attained. This is the field of "orthoptics" primarily. Linksz<sup>19</sup> states that "the objective of orthoptic treatment is reeducation of faulty binocular skills," while Miss Lancaster<sup>20</sup> says that orthoptic training is a matter of teaching binocular skills, but cannot change structure.

In the field of orthoptics more than in any other special phase of ophthalmology,



simple though sensible explanation of the problem to the parents, gaining the interest and maintaining the attention of the young patient, and instilling enthusiasm for the successive steps in treatment by the orthoptist are prime essentials for success. "Rapport" between patient and operator is more important than technical procedure. Conversely, failure in any of these endeavors will lead to failure in orthoptic treatment.

The more specific causes of failure in the field of orthoptics are: 1. failure to recognize and adequately to treat suppression, 2. failure to recognize and treat abnormal retinal correspondence, and 3. failure to correlate surgery and orthoptics properly.

Particularly confusing to many who have superficially viewed binocular relationship is suppression. They fail to recognize that good vision may exist, or be established in each eye, and very deep-seated suppression still be present. The large numbers of alternating suppressors are a major problem in the treatment of squint. The persistence of suppression in the monocular squinter after amblyopia has been overcome is a common cause for failure in further progress. Mrs. Adler, Miss Lancaster, and Feldman mention suppression as a major difficulty in the treatment of squint; Miss Lancaster believes that overcoming suppression is the most difficult step in all orthoptic procedure. Feldman found suppression present in 80 percent of his private and 60 percent of his clinic cases, and was able to overcome it in about 50 percent of patients in each series.

Abnormal retinal correspondence is present in approximately 50 percent of all squinters (Ellett, 36 percent; Davis, 36 percent; Pugh,<sup>21</sup> 50 percent; Travers,<sup>22</sup> 56 to 60 percent; Smith<sup>23</sup> 50 percent; Feldman, 14 percent private and 30 percent clinic; and Hitz, 57 percent). It is

evident, then, that in the treatment of about 50 percent of all squinters, so-called binocular training without recognition of abnormal retinal correspondence can but lead to a deepening of the abnormal correspondence and make the eventual cure more difficult, if not impossible. The prognosis for the non-surgical cure of abnormal retinal correspondence ranges from the rather complete lack of success reported by Fowler<sup>24</sup> on minimal orthoptic treatment, to the almost 100 percent cures reported by Miss Lancaster<sup>14</sup> as the result of prolonged and intensive orthoptic training. Successes variously reported have been by Miss Smith<sup>23</sup> almost all cases, Feldman<sup>2</sup> 50 percent, and Hitz<sup>3</sup> 58 percent.

Both suppression and abnormal retinal correspondence occur more often, and are more "fixed" the earlier the age of onset of the squint, the longer the duration of the squint, and the more constant the angle of deviation. It is apparent, then that the earlier treatment is begun, the surer will success be. Failure in early constant occlusion until retinal correspondence is normal and well established and the eyes are straight will almost invariably cause failure in obtaining functional cure.

The finishing steps in orthoptic treatment are just as important, equally difficult, and much less often attained. They are the obtaining of adequate amplitude of fusion and the ability to transfer binocular skills from instruments to daily visual tasks. The rewards for carrying functional cure to completion are: 1. stabilization and "anchoring" of the eyes in the straight position gained, 2. adequate true depth perception, and 3. retention of vision in the cured or improved previously amblyopic eye. Persistence in treatment as exemplified by some of our British and American orthoptists has merit.

### RELATIONSHIP OF ORTHOPTICS AND SURGERY

The correlation of surgery and orthoptics in the treatment of squint presents an interesting problem, and some excellent work has been done. What effect does pre- and postoperative orthoptics have on the deviation, and on the final functional result? What effect does abnormal retinal correspondence have on surgery? What effect does surgery have on abnormal retinal correspondence? The answers give us clues to the successes and failures in surgical treatment of squint.

Miss Pugh<sup>21</sup> states that surgery in the presence of abnormal retinal correspondence may result in: 1. the establishment of normal retinal correspondence immediately postoperatively, 2. the persistence of the abnormal correspondence at the new angle, and a change in the angle of anomaly, and 3. finally and most disastrously, the persistence of abnormal retinal correspondence, and a return to the original deviation. Miss Smith<sup>23</sup> cites 25 patients with abnormal correspondence operated upon, of whom 14 (56 percent) obtained normal correspondence, while in 11 (44 percent) abnormal correspondence persisted, with return to the original deviation. Grant,<sup>6</sup> in discussing Dunnington and Wheeler's report, states that young squinters with abnormal retinal correspondence will frequently become normal after surgery. I have found this often to be true. I would suggest that about 50 percent of the patients with abnormal retinal correspondence operated upon will develop normal retinal correspondence, and have not hesitated to operate if intensive training and occlusion have not changed the retinal correspondence in several weeks.

The effect of abnormal retinal correspondence and orthoptic training on surgical procedures has been well studied by Bressler,<sup>12</sup> Berens, Elliott, and Sobacke,<sup>11</sup>

and Hitz.<sup>3</sup> Bressler found that of 150 patients operated on who had had no orthoptic treatments, 32 percent had straight eyes and 8 percent had some fusion; of 32 who had only postoperative orthoptic training, the eyes of 47 percent were straight and 75 percent had some fusion; while of 36 who had pre- and postoperative orthoptics, the eyes of 56 percent were straight, and 81 percent had some fusion. A similar result was obtained by Berens and his associates. Of 324 patients operated upon 144 had surgery alone, of whom 22 per cent obtained straight eyes (phoria or better) and 46 percent had some fusion; of 83 operated on and given postoperative orthoptics only, 50 percent had straight eyes and 80 percent had some fusion; whereas of 97 patients having pre- and postoperative training, 63 percent had straight eyes and 82 percent had some fusion. The percentage of overcorrection was appreciably smaller in those patients having pre- and postoperative orthoptics. It was an interesting fact that while there was a higher percent of satisfactory alignment in those who had had pre- and postoperative orthoptics, the fusion status and the number of cases of normal retinal correspondence were not appreciably better in those having pre- and postoperative training than in those having postoperative orthoptics alone.

Hitz found that 47 percent of patients having surgery but no orthoptics had some fusion, whereas 74 percent of those having surgery and pre- and postoperative orthoptics had some fusion. Also, he found that on operating upon patients with abnormal retinal correspondence he obtained a 69-percent cure of deviation, whereas in cases with normal retinal correspondence 85-percent cure of deviation was obtained (table 1).

It may be assumed from these studies that orthoptic training definitely improves

the percentage of satisfactory postoperative alignment and fusion status, and that the percentage of overcorrections is less. However, the case for pre- and postoperative orthoptics, as opposed to postoperative orthoptics alone, may not be so decisive. None the less, it may be concluded that the failure to associate orthoptics with surgery increases the percentage of failures in final functional cure.

strongly the necessity for careful analysis of the individual squinter before any surgery can be considered. Davis,<sup>7</sup> Dunnington,<sup>25</sup> and others have discussed this at some length. In considering the results of such a careful analysis, it is well to reemphasize that eyes with a purely accommodative squint, or the accommodative element in any squint, should not be touched by surgery. On the other hand, eyes with a purely mechanical squint, or

TABLE 1  
RELATIONSHIP OF ORTHOPTICS AND SURGERY

Authors	Total Patients Operated On	Surgery Only		Postop. Orthoptics		Pre- and Postop. Orthoptics	
		Straight percent	Fusion percent	Straight percent	Fusion percent	Straight percent	Fusion percent
Bressler	150	32	8	47	75	56	81
Berens, et al.	324	22	46	50	80	63	82
Hitz			47				74

In considering the role of orthoptics in the success or failure of treatment for squint, I would suggest that delayed treatment, inconstant treatment, or the failure to obtain active interest and coöperation from the patient, will lead to failure. I would stress the absolute necessity of continuing monocular occlusion throughout the treatment for amblyopia, through the preoperative training, through the surgery, through the postoperative course, until alignment and fusion are assured. The interruption of occlusion is a mistake.

### SURGERY

The surgical causes of failure in the treatment of squint would seem to be chiefly: 1. lack of careful preoperative analysis, 2. the occurrence of a vertical imbalance associated with the lateral, and 3. failure to preserve adequate function of the individual muscles, and the convergence function.

It is not possible to emphasize too

the mechanical element in any squint, must of necessity be operated on. Measuring carefully the *total* squint (that is, with the patient accommodating, wearing no correction, and not under cycloplegia) and deducting from it the *mechanical* element (that is, with the patient under full cycloplegia and with full correction), will yield the *accommodative* element. This element is not cured but is made worse by surgery.

It is possible that the 3-to-8-year-old group of Dunnington and Wheeler, in which they obtained an undue percentage of overcorrection, may have contained many accommodatives. It is known that the accommodatives usually do not assert themselves well until the age of 3 or 4 years, and that they become stabilized somewhat at the age of 6 to 10 years. Thus the 3-to-8-year group would have the greatest number of unstable accommodatives, and when operated on would yield a large percentage of overcorrections.

As to the combination of vertical and lateral imbalance, the literature is replete with evidence that such a combination is most difficult to cure. It is a rather common occurrence, moreover, if a given series is analyzed carefully. White and Brown<sup>9</sup> found an incidence of 34 percent combined vertical and lateral imbalance in a group of 1,062 squinters, whereas Feldman<sup>2</sup> found 80 percent verticals among his private cases and 55 percent in his clinic. It is significant that he could cure only 10 percent of his private and none of the clinic patients. Fralick,<sup>8</sup> and White and Brown<sup>9</sup> stated that more surgery seemed necessary in such cases, and the number of satisfactory results was less than when a lateral squint alone was present. Both, however, felt that the substitution of recession of the inferior oblique for the more common myectomy offered greater possibilities of success.

In considering the surgery in such combined cases, White and Brown suggested that the operation be performed on the vertical muscle first, unless the lateral squint was large. They felt that the lateral rectus may be operated upon with greater safety than the medial rectus, and that in many cases the lateral and an inferior oblique may be safely operated upon together. Allen, however, is reluctant to operate upon vertically and laterally acting muscles at the same time. I am inclined to operate upon the lateral first whenever it is large, and have not hesitated to recess an inferior oblique at the same time. One point of caution should be made: When an esotropia and moderate overaction of the inferior oblique is being considered, it must be remembered that correcting the esotropia throws the ocular alignment away from the chief field of action of the inferior obliques, and minimizes their effect. Thus, in many instances the inferior obliques need not be touched after the

esotropia has been corrected.

The final point in considering surgical failure is that of preserving individual muscle function and the convergence function. This cannot be stressed enough. Dunnington and Wheeler,<sup>5</sup> and Duthrie<sup>26</sup> have emphasized this point. I have noted in examining postoperative cases in the orthoptic clinic at Episcopal Hospital, that many patients who have a satisfactory cosmetic result in the primary position will have an obvious weakness of abduction or adduction in the eye that has been operated on, or an equally obvious weakness of convergence. Even the more moderate postoperative weaknesses will probably preclude a functional cure. I do not wish to minimize the importance of a great cosmetic improvement, but to obtain binocular single vision is even more desirable.

Some points in technique causing these failures are: 1. the difficulty in gauging the surgery necessary in the individual case, 2. the difficulty in determining the exact amount of recession or resection accomplished, 3. too much recessing or shortening of a single muscle, 4. too many muscles operated on at one time, and 5. disproportionate recessions and resections of opposing muscles.

I am sure that every surgeon has had difficulty in applying the general rules to his individual case, in trying to decide what and how much surgery to do, and then, when operating, has not been able to estimate just how much he has set his muscle forward or back. The amount of stump, the amount of muscle in the muscle clamp, the exact placing of the sutures in the muscle, and whether they will stay there or not, are all factors with which he must reckon.

Dunnington and Wheeler, as also Bressler, felt that combined recession and resection give the most satisfactory results. Recession alone was rather dis-

appointing in amount, Dunnington getting an average correction of only 7.3 prism diopters for a 5-mm. recession, while a 5-mm. recession and a 10-mm. recession allowed an average correction of 40 prism diopters.

It need not be stated that the unguarded tenotomy of a medial rectus is likely to result in failure, since such unguarded procedures must lead to extremely variable results. The same thing may now be said about the myectomy of the inferior oblique. The recession of this muscle is definitely preferable.

To emphasize again the surgical causes of failure, we must list insufficient or inaccurate preoperative analysis, the frequent occurrence of combined vertical and lateral imbalance, and, finally, the failure to preserve the individual muscle and convergence functions.

#### SUMMARY

An attempt has been made after a somewhat brief reference to the literature, to list and discuss the pitfalls in the treatment of squint. The commonest and most important of these would seem to be: 1. persisting amblyopia—due to belated, inconstant or insufficient occlusion; 2. failure to recognize or sufficiently treat suppression and/or abnormal retinal correspondence; 3. the difficulty of managing a combined vertical and lateral imbalance; 4. the failure to distinguish between the

accommodative and the mechanical elements in a given squint; and 5. the failure to stabilize and obtain functional cure by adequate postoperative orthoptic training.

#### COMMENT

A somewhat brighter note might be injected after all of the difficulties have been mentioned. The chances for grade-1 cure would seem to be good in the following types of cases: 1. pure accommodative convergent squint—which should be treated by orthoptics (with the aid of glasses); 2. pure divergence excess—to be treated by surgery and orthoptics; and 3. pure divergence insufficiency—to be treated by surgery and orthoptics also.

The over-all picture may be somewhat discouraging if the number of grade-1 cures could be exactly tabulated. However, a lesser grade of cure is better than a cross-eyed child.

I often wonder whether the prolonged orthoptic procedure to which some children are subjected is fully justified. Do that child's future ocular and binocular needs justify all of this time, expense, and wear and tear on the nervous system of the patient? I doubt it. We might, then, pick the cases for prolonged orthoptics in which there is the greatest chance of true cure, and make the other patients happy by simply making them look better.

1150 Connecticut Avenue (6).

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## DISCUSSION

MARJORIE V. ENOS (New York). Since we all have a certain proportion of failures, this is a subject of intense interest.

I think Dr. Costenbader's four grades of "cures" are very good, and I would suggest that we use them in the future in classifying records in doing research.

Perhaps one of the most discouraging failures is that of a postoperative exotropia following a preoperative esotropia. Dr. Berens has been kind enough to allow me to analyze nine cases from his records, seven of exotropia and two of exophoria following operations for esotropia. These patients were operated upon prior to 1938 and have been examined at this office within the past year. I might add that all of these patients were not operated upon by Dr. Berens.

In analyzing these patients I found that four had amblyopia with vision of less than 20/200 in one eye. Three of these improved to 20/50 or better. The fourth was an adult who found it impossible to undergo occlusion. The remaining five had approximately equal vision in the two eyes.

Six of the nine had anomalous correspondence, the other three normal correspondence.

Seven of these patients presented some hypertropia.

The refraction showed: four with hyperopia (one +3.75D. O.U., the other three of less than +1.00D. in each instance), two with myopia, three with practically no refractive error.

The surgery performed involved procedures on 28 different muscles: 12 resections of medial recti, 1 central tenotomy of a medial rectus, 4 resections of lateral recti, 1 O'Connor cinch on a lateral rectus, 6 tenotomies of inferior obliques, 1 myotomy of an inferior oblique, 1 myectomy of an inferior oblique, 2 resections of inferior recti.

The number of preoperative-exercise visits ranged from 1 to 3, 5, 30, and 35, but the number the patients may have had with other oculists could not be ascertained. All of the patients had exercises postoperatively except one adult who found them impossible. The two exophoria patients improved with exercises. Three of the exotropia patients have had further surgery with little improvement in one and 3d-class cures in two (Dr. Costenbader's classification).

We realize that these are too few cases from which to draw conclusions, but the high incidence of anomalous correspondence and hypertropia show them to be contributing factors in failures. Certainly these were not accommodative squinters on whom operations were mistakenly

done. The boy who showed the hyperopia of +3.75D. at the age of 7 years did not show it at the age of 13.

Dr. Costenbader has asked me to mention the relationship between the technician, the patient, and parents and to show what factors in this relationship may make a cure difficult. Of course, the noncoöperation of either patient or parent is the greatest stumbling block. There must be a will to achieve. I have found my best approach with the 5-year-old is to get on a friendly basis with the child, making the parents quite secondary, and put the coöperation up to the child himself. "Jack, you know *we* want to help your eyes, do *you* want to help? Will you try to do what your eyes need? Wear the patch? Work hard at your exercises?" and I find it brings much better results than trying to make the exercises a pseudo play period. Not that we don't have fun but if the child knows he is at the office

on serious business we get much further. The younger children have to be handled differently, and I find that the hardest period which most of them go through is when play must give place to work.

How to explain the squint and its difficulties to the parents is a problem on which technicians have been working; I have found that time and patience, using terms which the parent can understand, provide the best solution. Some parents are helped by printed material to read, but most of them want to have the situation explained in relation to the individual child. In most cases we find that each patient is an individual problem, with no two just alike. I believe that this is something we need to keep in mind, for it is very easy to catalog patients as certain types of cases and forget the human element involved.

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# NOTES, CASES, INSTRUMENTS

## GONIOTOMY

### PRELIMINARY DEEPENING OF THE ANTERIOR CHAMBER WITH AIR OR SALINE SOLUTION

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There are two chief difficulties associated with the performance of goniotomy: the root of the iris may be caught with the tip of the knife and the peripheral part of the iris may fall before the knife toward the end of the incision, owing to escape of aqueous. I have found that these difficulties can be prevented by injecting the anterior chamber with saline solution or air prior to goniotomy.

*Injection of saline solution preliminary to goniotomy.* Physiologic saline solution (intravenous) is introduced for the purpose of widening the angle. It produces a troughlike circular depression of the peripheral portion of the iris, abolishing the posterior chamber and causing the iris to hug the surface of the lens. The normal bulge of the iris is replaced by a concavity. In addition, the excess pressure of the aqueous in the anterior chamber and the absence of aqueous in the posterior chamber prevent the iris from falling before the knife, even if some aqueous escapes through the puncture during the incision.

In adults, preliminary deepening of the chamber\* is particularly helpful in eyes of normal or shallow-chamber depth (emmetropia or hyperopia) and in those in which the chamber is made shallow by the large size of the lens. The procedure

\* Deepening of the anterior chamber with saline solution as a preliminary to cataract extraction in the presence of a shallow chamber and to iridectomy in glaucoma was originally suggested by Howard.<sup>1</sup> It was incorporated by me in a procedure for iridectomy in glaucoma of the narrow-angle (shallow-chamber) type.

is also helpful in myopic eyes, though not so necessary since the chamber is already deep and the entrance to the angle is wide.

In infants with congenital glaucoma preliminary deepening of the chamber is rarely indicated because of the increased depth of the anterior chamber in this condition. However, in cases in which cloudiness of the cornea precludes operation under the contact glass and renders visibility difficult even in goniotomy without the glass, preliminary deepening of the chamber is helpful.

Deepening of the chamber by means of injecting saline solution may also be indicated postoperatively in the occasional case in which there is undue bleeding, in order to raise the pressure and stop hemorrhage. It also prevents contact of raw surfaces and formation of adhesions between the iris and the incision in the angle wall.

*Injection of air preliminary to goniotomy.* In 1938, in the course of cyclodialysis, I observed that injection of the anterior chamber with air not only deepened the chamber but also made the angle visible without the contact glass. It was evident that injection of air into the anterior chamber provided conditions which would make goniotomy without the glass feasible. This was confirmed in the rabbit and the dog. I have injected sterile air into the anterior chamber in several cases for this purpose. However, disturbing factors may present themselves, such as reflections from the anterior and posterior corneal surfaces, or production of folds in Descemet's membrane by the fixation forceps if the pressure has been lowered. Moreover, the size of the image is smaller than when seen through the magnifying system of cornea and aqueous or cornea and saline solution. The magnifying power of these fluids for oblique observation



as in goniotomy is approximately 1.15 X. When combined with the power of the contact glass the total magnification when seen through the contact glass, cornea, fluid system amounts to about 1.73 X, whereas there is no magnification when

seen through air.

Further experience and observation of results will do much to determine the relative merits of the various modifications of goniotomy.

490 Post Street.

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### AN ATYPICAL CASE OF MARFAN'S SYNDROME

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*Camp Lee, Virginia*

In a recent publication by Rados,\* the subject of ectopia lentis associated with arachnodactyly was so completely covered that there is very little to add concerning this rare and interesting condition. The author stressed genetics in his explanation of the syndrome and believes that any theory which considers a disturbance in the germ-plasm should receive special credence. It is pointed out that hereditary factors which may be located in the same chromosome may be subject to "coupling." Such genetic "coupling" could explain the frequent association of abnormalities arising from different germ layers that occur in one person. Any theory which attempted to explain Marfan's syndrome as a congenital mesodermal dystrophy presented difficulty in explaining the position of the ectopic lenses in this syndrome because of the ectodermal origin of this ocular part of the syndrome.

The case herein described offers several features which are atypical and which perhaps may add further to the theory of

genetic coupling and possibly even of "crossing over within the chromosome."

The patient, a colored man aged 22 years, was examined in June, 1942. He had come because of his poor distance vision, which with the right eye was 2/200 correctable to 5/200 and in the left eye was 20/40 correctable to 20/30. His glasses were last changed about two years earlier. The patient believed his glasses were not so good as they had been when he first secured them. However, he did not suspect that any condition was present which could not be helped by glasses. He knew that his vision in the left eye had not been so good as that in the right eye for about five years, but he had not realized that the difference was as great as actually existed. There was no history of trauma to the eyes nor was there any indication of previous ocular disease. The past history failed to uncover any significant childhood illnesses. The patient had never been hospitalized and had never suffered from any serious injuries. He thought that his physical make-up closely resembled that of his father. His mother was rather small and showed no remarkable physical likeness to himself. There were three brothers none of whom particularly resembled the patient. The family history disclosed no abnormality of

\* Rados. Marfan's syndrome. *Arch. of Ophth.*, 1942, v. 27, March, p. 477.

the eyes and no significant systemic diseases. The patient did not recall the stature of either his maternal or paternal grandparents. He knew of no immediate nor remote relatives who had ocular or developmental skeletal anomalies. He had been well all his life and had worked chiefly as a stevedore. He suffered at no time from shortness of breath or other symptoms referable to the cardiorespiratory system.

The patient weighed 198 lbs. and measured 73.5 inches in height (fig. 1). His



Fig. 1 (Rosen). This gives an idea of the patient's great "span" which was greater than his height.

muscular system appeared well developed but there was no excessive formation of subcutaneous tissue. The patient's skull was dolicocephalic, with extremely prominent supraorbital ridges. The frontal "bosses" were very pronounced, causing the supraorbital ridges to end in the mid line in the form of a "V." The eyebrows were heavy and extended well onto the glabella, meeting in the mid line. The hairline formed a downward point in the region of the bregma. The nose showed a

deeply sunken broad base and resembled a "boxer's" nose because of the prominent oblique ridges where osseous and cartilaginous tissues unite. The nasolabial folds were very deep. The chin was somewhat prominent and square. There was no



Fig. 2 (Rosen). Shows the patient's facial appearance. There is a worried, sad appearance, although the patient is in his early twenties. The prominent frontal bones, the elongated head, and the wrinkled brow all stand out prominently.

abnormality of ears, lips, or teeth. The palate was high and quite narrow. The characteristically sad and aged expression of the patient was apparent (fig. 2).

There was no abnormality of the neck. The limbs were very long but fairly well developed. They could not be considered "gracile." The patient's span was 76 inches ( $2\frac{1}{2}$  inches greater than his height). His arms were so long that the open hand almost reached his knees. His hands were 10 inches in length but were not characteristically arachnodactylic, being proportionately enlarged rather than specifically gracile. X-ray studies disclosed no relative enlargement of one of the carpals or phalanges over any other bones. There was a slight indication of webbing

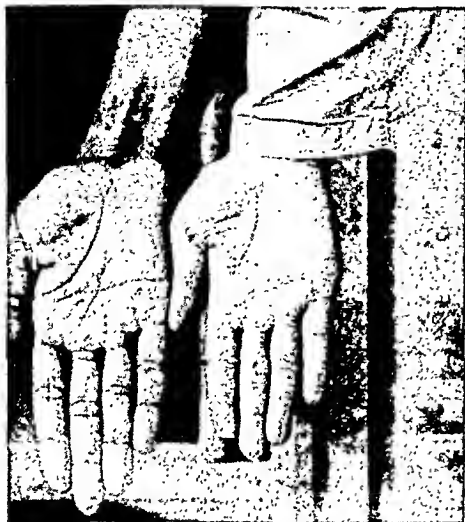


Fig. 3

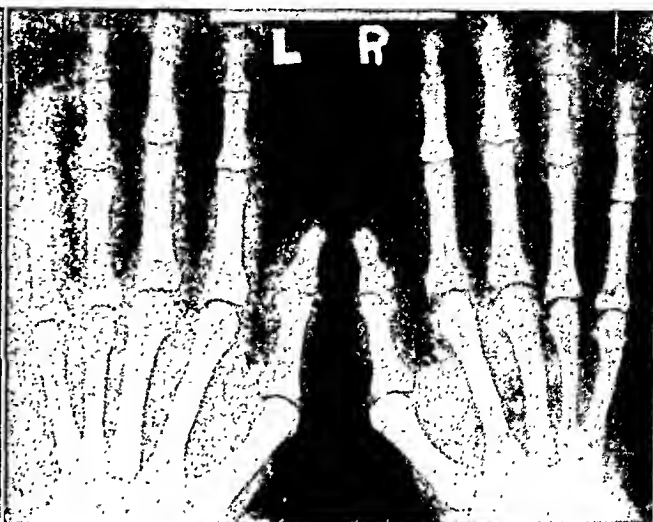


Fig. 4



Fig. 5



Fig. 6

Figs. 3, 4, 5, 6 (Rosen). The characteristic appearance of hands and feet together with their respective X-ray views.

of the hands. The patient wore size-12 shoes, which were quite narrow. The great toe was  $5\frac{1}{4}$  inches long. The foot tapered rapidly. X-ray studies revealed an intorsion of the terminal lateral three phalanges of each foot (figs. 3, 4, 5, 6).

The chest wall was elongated but some-

what narrow and flat, with a tendency toward pigeon-breast formation. There was no special curvature nor abnormality of the scapulas. The thighs appeared disproportionately long and both patellas seemed to extend well above the knees. No anomalies of the feet, such as club feet

or hammer toe, were noted.

Cardiologic consultation was reported as being negative. X-ray film of the heart was normal, and electrocardiographic tracings were reported as being within normal limits. No abnormality of the aorta or other vessels was encountered.

The patient's eyes were rather light brown in color. No gross disturbance of muscle balance was obtained except upon testing the near point of convergence, when it was noted that the left eye turned in until 145 mm. and then diverged. The corneas were clear and quite large, being 12.5 mm. in diameter. The anterior chambers were deep. The pupils responded to both light and accommodation. There was a pronounced tremulousness of each iris.

The right lens was displaced upward and outward; the left was displaced upward and inward but to a much less degree. The exposed lower border of each lens was thrown into a series of sinuous folds and the zonular fibers in each eye were readily visible (fig. 7). The pupils dilated readily with homatropine and parendrine, contrary to the usual difficulty encountered in most cases of this condition. Slitlamp studies showed the lens of the right eye to be displaced so superiorly that vision could not be improved through refraction, whereas in the left eye the lower edge of the lens was somewhat removed from the pupillary axis, and correction to 20/25 vision was obtainable. The arrangement of the zonular fibers could easily be studied and these were seen to pass both anterior and posterior to the edge of the lens. In some positions the fibers were deficient, and in these regions a corresponding flatness of the lens edge could be seen (fig. 7).

There was no granule deposit upon the zonular fibers. The vitreous was not unusual nor did the fundi show any remarkable variations from the normal. The correction accepted for the left eye was

—1.25D. sph., giving vision of 20/25.

From a review of the case reports, the occurrence of Marfan's syndrome in a colored person is not too common even if it is incomplete. The ocular signs in this case were atypical in that the pupils dilated readily with mydriatics, and there was no high degree of myopia (O.S.



Fig. 7 (Rosen). The dislocated cataractous lens is seen to be displaced upward. The zonular fibers are readily visible.

—1.25D. sph.). On the other hand, characteristic iridodonesis, ectopia lentis, and megalocornea existed (12.5 mm. diameter in each eye). It would seem that amongst the ocular signs themselves there was some indication of an "aberrant ocular anlage."

There was no real disturbance in subcutaneous fat or musculature, as is described in the typical syndrome. Although there was an apparent over-all skeletal enlargement there was no suggestion of "gracility." The patient's hands and feet were large but they were not particularly thin. The patient's span, skull, and chest fitted in more closely with the habitus of "status dysraphicus." There were no anomalies of the cardiac system.

This case presents some features con-

stant in Marfan's syndrome with others suggestive of the "status dysraphicus."

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## A NEW VISUAL-TEST CABINET

LESLIE C. DREWS, M.D.

*Saint Louis*

This apparatus allows us with the pull of a single counterweighted cord stretched across the room to spin the test characters, and to present six different-sized test characters one at a time.

This apparatus was shown before the Southern Medical Association, Section of Ophthalmology in 1941. Publication and description are prompted now by a recent paper of Dr. Walter H. Fink, "An evaluation of the visual-acuity symbols," at the American Ophthalmological Society in May, 1944.\* Fink advocates the use of a modified Landolt ring with multiple breaks in the circle. The "illiterate E," of course, could also be used with this cabinet.

The inexpensive test cabinet is designed to permit its use in the many places where visual acuity is being tested. Obviously it is often impractical to suggest the use of a projector. One could use a single 20/20 Landolt Broken Ring and determine at what distance the patient can see it. But it is so simple to build and maintain the apparatus as shown, and it is so much more usable to have at least six different-sized rings, that a cabinet with only one ring is not practical. Besides, the most objectionable feature of such an apparatus is the cord stretched across the room, and one cord is the minimum that could possibly be expected. Even a cabinet with only one broken ring would require one cord to spin the ring. This cabinet needs but one cord.

For ophthalmologists who do not use a projector, a combination of such an apparatus with a regular test chart is of considerable value. The standard test chart does not give enough choice of large letters. There are only a few large letters, and these are quickly learned. This cabinet could be equipped with 20/400, 20/300, 20/200, 20/150, 20/100, and 20/75 Landolt Rings. The ophthalmologist then would have an infinite number of test characters of these sizes. It is much harder to memorize the smaller letters on the Snellen charts since there are many more of them, and the use of two or three Snellen charts showing letters of only 20/60 and less is simple and not too bulky. The selection actually demonstrated was 20/200, 20/150, 20/100, 20/70, 20/40, and 20/20 characters, but any combination desired could be used. The aperture in the front of the cabinet was made large enough to expose the 20/400 ring.

*Description of apparatus.* The test characters are mounted on small wheels which are spun on axles (fig. 1). The axles pass through a strip of plywood and are fastened to small wooden pulleys of varied sizes on the opposite side of the plywood strip (fig. 2). By raising or lowering the single counterweighted cord (#1) stretched across the room the operator gives impetus to the strip of plywood, moving it up or down. The plywood strip is counterweighted with string #2 and weight *W*. In moving up or down, a fixed pulley (*a*) is caused to spin by the counterweighted string #3. The tension of this #3 string must be maintained so that the string wrapped around pulley *a* will move all the rest of the pulleys. In order to maintain this proper tension without tightening the string occasionally, the string is carried over a fixed pulley and counterweighted with weight *W*2. The counterweight must be heavy enough to

\* Amer. Jour. Ophth., 1945, v. 28, July, p. 701.

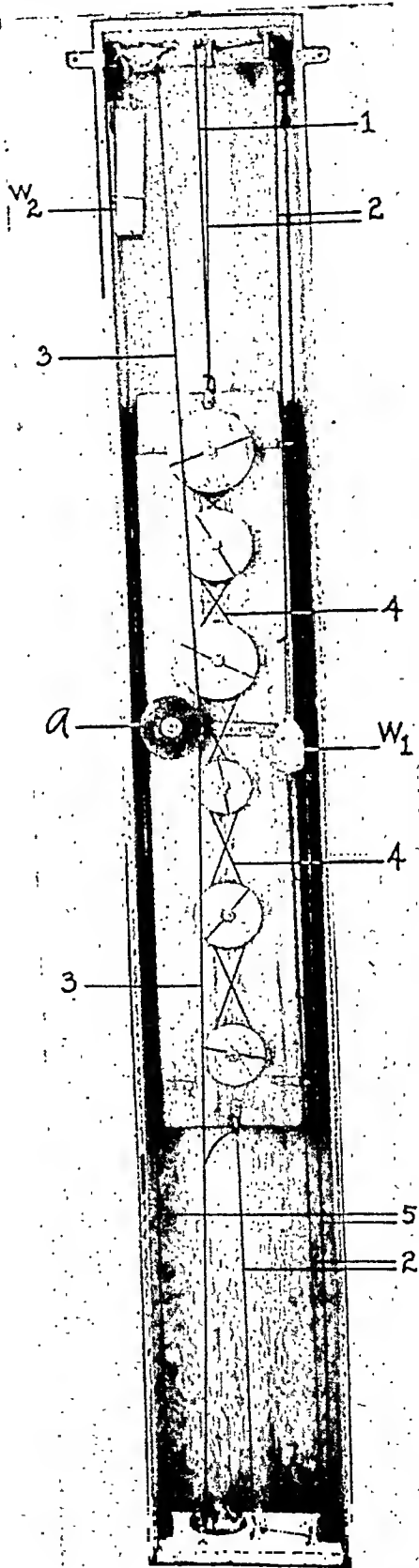
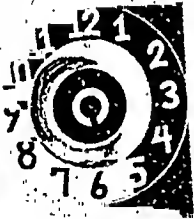


FIG. 2

Fig. 1 (Drews). Face of the visual-test cabinet.

Fig. 2 (Drews). Rear view of visual-test cabinet.

produce the necessary tension. A ball-bearing pulley is used here so that the counterweight may always produce the correct tension.

A second pulley, just behind pulley *a* in the photograph, is placed in contact on its flat surface with pulley *a* through a ball-bearing friction device so that the second fixed pulley spins only when the plywood is moving downward. This ball-bearing friction feature could be omitted and the two pulleys fastened rigidly together. A continuous string (#4) is wound around this second pulley and around all six of the pulleys on which the six test characters are mounted. The plywood strip is held in perfect vertical plane by two wires (#5) stretched from top to bottom of the cabinet and passing through metal rings attached to the plywood strip as shown. Since the test characters are rotated by pulleys of varied sizes they all rotate different amounts with each downward movement of the plywood strip. And since the pulley imparting motion to the pulleys bearing the test cards moves only on downward movement of the plywood strip, on upward movement all the test characters remain stationary. Besides, alternate test characters spin clockwise and counterclockwise. The lines on the pulleys (fig. 2) were placed there so that the observer could see that these pulleys spin at different speeds and in different directions. The clock numbers on the front of the cabinet are added for convenience, but may be omitted if desired. No special lighting has been provided. With such a small area to be illuminated this can easily be done.

The apparatus has one disagreeable feature: *even the examiner himself cannot tell what the correct answer is without seeing the characters.*

516 Metropolitan Building.

## THE IMPORTANCE OF INJECTING AIR INTO TENON'S CAPSULE EVEN IN CASES OF FOREIGN BODIES WITHIN THE EYEBALL

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It is possible, as this case report well illustrates, to localize a foreign body within the interior of an apparently normal-sized eyeball, with extremely accurate measurement, and yet be in entire error as to its actual locale. It therefore at once becomes evident in cases of related pathologic change that some other clinical procedure is necessary to confirm the diagnosis than just those tests that we are at present employing. The following case is presented to point out this startling shortcoming in our present-day methods.

The patient, W. M., aged 25 years, was referred to the hospital for the purpose of having an enucleation of his right eye performed because of the possibility of sympathetic ophthalmia. His ocular story dated back some three years, at which time, while in the dangerous performance of striking the head of an axe with a hammer, an intraocular foreign body was acquired. Upon subsequent inspection of the hammer the patient was able to detect a notch in the tool he was using, and sensing the entrance of a foreign body into the right eye, he sought immediate medical aid. Appropriate procedures were undertaken, including slitlamp studies, X-ray localizations, and tests for magnetism; magnetic extraction was attempted. Two trials were made to extract the foreign body, both unsuccessful. Following the second attempt the patient noticed that the right eye was somewhat higher than the left. In the next two years the patient suffered from recurrent

attacks of redness in the right eye, which usually cleared in three or four days. Vision had been reduced to light perception within six months after the injury through development of a complicated cataract. About six weeks before the patient's initial examination at our hospital, a minor direct injury occurred to the right eyeball, necessitating hospitalization at a station hospital. There an intraocular foreign body was visualized. The case was considered one for surgical removal as a prophylactic procedure in view of the recurrent attacks of redness and the visualization and localization of an intraocular foreign body.

Upon the initial examination the right eye was found to have light perception only. The lid of the right eye appeared slightly lower than the left and the right eye was seen to be a good deal higher than the left. Motility seemed to be good in the cardinal directions of gaze.



Fig. 1 (Peter and Rosen). The posterior aspect of the eyeball with the black seedlike mass lying in front of the brownish sacklike herniation that is just lateral to the foreign body. Both structures appear to lie within a funnel-like pit. Just lateral to the foreign body is a rather unusual view of the optic nerve, central artery, and vein and the vaginal sheath of the optic nerve. Some of the stumps of the extraocular muscles can be seen.

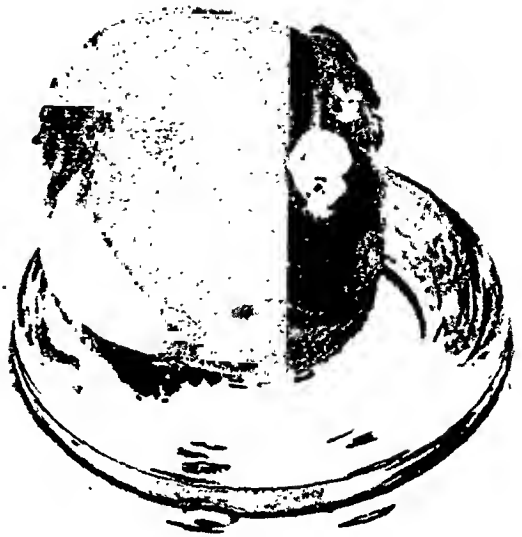


Fig. 2 (Peter and Rosen). A lateral view which shows a side view of the cornea and sclera indented at the point of entry of the foreign body. The foreign body is seen lying above the herniated uveal tissue and looking like a piece of coal.

There was a somewhat dense scar in the conjunctiva, running from the limbus at the 10-o'clock position to the cul-de-sac in a similar meridian. A second defect was visible in the conjunctiva at 3 o'clock about 1 mm. external to the limbus, where the sclera was puckered, indented, and discolored. The pupil was drawn toward the limbus at the 3-o'clock position in the manner of a narrow iridectomy, and both pillars of the colobomatous iris were incarcerated in a corneal limbal scar in that area. The pupil reacted promptly to light both directly and consensually. The iris was of greenish color; that of the fellow eye was grayish. There was no disturbance in the anterior chamber—no cellular deposits and no "K.P's." There was a dense calcified whitish cataract which was completely opaque. Transillumination appeared to be negative. The left eye showed no abnormalities, certainly none related to inflammatory changes such as might be suspected in sympathetic ophthalmia.

The eye was enucleated under intra-



venous sodium-pentothal anesthesia. Some difficulty was encountered in attempting to undermine the conjunctiva at the 10-o'clock position, where the conjunctiva

An anomalous insertion of the external rectus was encountered, probably secondary to multiple adhesions resulting from hemorrhage. After the severance of all



Fig. 3, (Peter and Rosen). A lateral view of the X-ray plate, showing the markings of the Comberg contact lens. The foreign body is shaped like an arrowhead and upon measurements lies 16 mm. behind the limbus.

was bound down to the sclera. At 3 o'clock another adhesion was present, rather close to the limbus, which, however, presented no great difficulty and was dissected out.

the external muscles the nerve was cut, whereupon the peculiar shape of the globe became apparent. In the posterior aspect of the globe, just nasal to and above the

severed optic nerve, was a brownish-black structure, almost the size and shape of a small watermelon seed, which seemed to lodge in a declivity of the posterior wall of the eye. The picture was a striking one (fig. 1) and resembled the dimple and stem of an apple. Many loose adhesions were present around this seedlike mass, which, after separation, allowed the herniated sac (probably uveal and retinal tissue) to be visualized clearly. With a slight amount of pressure, a metallic foreign body was expressed from this seed, much like a pit from a grape. The herniated tissue could then be traced down to a small cleft in the sclera which seemed to be closed off more or less completely (fig. 2).

X-ray films taken by several men placed the foreign body in the eyeball itself. X-ray studies were made at the time of injury and a few months later. The patient was shown the foreign body upon the film and was told it was intra-ocular. He learned to recognize the shape of this foreign body and readily pointed it out in a subsequent examination upon the X-ray film. The eye was again X-rayed at a station hospital where again the foreign body was believed to be within the eye. Indeed, because of the location of the foreign body and recurrent redness of the eye the patient was transferred for enucleation. The eye was again X-rayed at this hospital, a picture being taken with the eye looking in the medial and the extreme lateral positions. Because of the shift of the foreign body in each view it was assumed that the foreign body was in the eye, moving with that structure. Not being completely satisfied with this study, we applied a Comberg contact lens to the eyeball for further localization. After corrections were made in accordance with the magnification factor it appeared that the foreign body was located 16 mm. posterior to the horizontal

limbal markers, which placed the foreign body definitely within the eyeball. No great difficulty appeared in establishing this foreign body within the eyeball especially when the eyeball was considered to be emmetropic or close to emmetropia. The patient believed his right eye was normal, no glasses having been used prior to the accident (figs. 3 and 4).

A recently rewritten article by Pfeiffer<sup>1</sup> on X-ray localization appears to establish

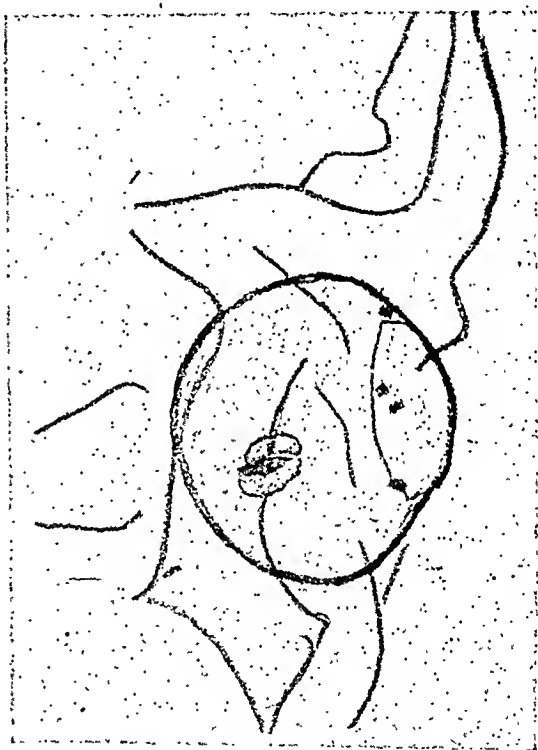


Fig. 4 (Peter and Rosen). A schematic sketch which attempts to illustrate the approximate position of the eyeball upon the X-ray plate.

the Comberg technique of localization as the method of choice after he had tried experiments with five other procedures. Most industrial ophthalmologists consider this procedure superior. For its outstanding advantage Pfeiffer claims accuracy. He also reiterates that successful extraction depends upon accurate localization and states that precise localization is imperative. The importance of air injection

into Tenon's capsule when a foreign body is in or at the posterior sclera or when there is a double perforation has been pointed out.<sup>2</sup> However, this case report would seem to emphasize the importance of air injection in almost all cases of deeply located foreign bodies, for a lateral view in this case would have shown an indentation mapped out by the air injected into Tenon's capsule. Such a procedure would possibly have disclosed the "double penetration" and shown the fallacy of the application of the magnet.

Since the metallic body was enclosed in a sac with some retractile character it is possible that contraction bands were a factor in the production of the indentation of the posterior sclera. However, one feels that the application of a magnet in an endeavor to retrace a "double perforation" very likely brought about this marked dimpling. The importance of air injection thus must be emphasized especially in view of its comparative simplicity.

— *ASF Regional Hospital.*

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- Pfeiffer, R. Arch. of Ophth., 1944, v. 32, Oct., p. 261.  
<sup>2</sup> Spackman. Amer. Journ. Ophth., 1932, v. 15, p. 1007.

# SOCIETY PROCEEDINGS

EDITED BY DONALD J. LYLE

## NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

October 2, 1944

DR. MILTON L. BERLINER, *presiding*

### SYMPOSIUM ON ALLERGY IN OPHTHALMOLOGY

#### CHEMISTRY OF ALLERGY

MARGARET B. STRAUSS, M.Sc., stated that formerly antigenicity was associated exclusively with proteins, but it has lately been shown that polysaccharides and lipoids may also invoke antibody production. Many drugs, such as the anti-syphilitic arsenicals and sulfonamides, give rise to illnesses similar to the serum-sickness reactions seen to follow anti-bacterial serum therapy. Sensitivity to pure vitamin B<sub>1</sub> has been reported and there are many comparatively simple substances, known as haptens, which combine with proteins to form true antigens with the capacity to sensitize.

Recent work indicates that an antibody is a specifically modified molecule of globulin. Therefore, any cell which forms globulin may theoretically be capable of becoming sensitized. This sensitized cell may react anamnestically at some later date as a result of either a specific or a nonspecific antigenic stimulus.

Desensitization does not occur in man for that type of allergy known as hay fever. The skin-sensitizing antibody is not appreciably reduced in concentration after treatment with the antigen, but a new type of antibody is produced which has a greater affinity for the antigen and so the latter is not available to react with the skin-sensitizing antibody in the blood

or tissues, and this explains the alleviation of clinical symptoms of hay fever.

#### PHYSIO-PATHOLOGY OF ALLERGY

DR. SAMUEL J. PRIGAL said there is no specific pathologic picture of an allergic reaction; many are reversible. Anaphylaxis shows but little other than marked disturbance in physiology—smooth-muscle spasm which causes different types of death in different experimental animals. Local anaphylaxis shows a distinct pathologic picture of inflammation and fibrinoid degeneration, subject to modifications by such factors as degree of sensitization, the amount of allergen used, time of application, and certain physical factors. It is an accelerated inflammatory response.

The pathologic picture commonly seen in asthma, hay fever, urticaria, contact dermatitis, and nasal polyp were briefly described. Allergization is enhanced or initiated by infection or its products, as Burky has shown. If his conclusions are correct, then it is possible that in intrinsic asthma one may be concerned with an allergy to the mucous membrane or degenerated products of the respiratory tract. A number of diseases of unknown origin may be of allergic nature. The pathologic picture of periarteritis nodosa, acute disseminated lupus, rheumatic fever, scleroderma, and dermatomyositis is suggestive of an allergic inflammatory reaction. Experimentally some of these diseases have been reproduced through allergization. Klinge injected horse serum into the joints of animals previously sensitized to it and demonstrated not only joint pathology but inflammatory responses in the myocardium. Bruun con-

firmed this and showed that application of cold could vary the pathologic picture. Rich was able to reproduce periarteritis nodosa experimentally by the use of horse serum.

It cannot be definitely stated whether an allergic response is a purposeful or an aberrant phenomenon. There are reasons to believe that allergy is one of the many defense mechanisms of the body. Allergy and immunity are closely related. Both are primarily concerned with an antigen-antibody reaction. In immunity no untoward reactions occur. Cohen believes this to be due to the fact that no H (histamine-like) substance is produced. In allergy, the liberation of the H substance in the tissues results in smooth-muscle spasm or allergic inflammation of the tissues. Opie states "in allergy vital organs are protected at the expense of the local injury."

#### OPHTHALMOLOGIC EXPRESSIONS OF ALLERGY

DR. FERDINAND L. P. KOCH said allergy and immunity in clinical ophthalmology are of importance, since certain ocular disorders are due to hypersensitivity and allergy, and because ocular diseases of other etiology may be influenced by allergy and immunity. Thus, there are to be considered the allergic reactions of the tissues of the external eye, allergy and immunity in intraocular infections, and the relation of these latter allergy-influenced diseases to organ-specific eye proteins. Allergens (antigens) may be bacterial in origin or may be substances incapable of producing any reaction except in the 1 or 2 percent of persons with a tendency to allergy who become hypersensitive after exposure to allergens.

Sensitization in ophthalmology may occur either locally (primary) or as a part of a systemic (secondary) process, and

any tissue or combination of tissues of the eye may exhibit these allergic processes. Allergies of the skin of the lids are usually more marked but essentially similar to those of the skin in general. Blepharitis may ensue because of contiguous skin or conjunctival allergy or it may occur alone. The offending allergens frequently require exhaustive clinical detective efforts to track them down. Basically these are chemical, for the most part, whether they are drugs, industrial agents or poisons, cosmetics, foods, plant pollens, and so forth.

Conjunctival allergy frequently co-exists with skin allergy. Acute allergic conjunctivitis frequently is very sudden in onset, with such marked chemosis that there is protrusion of the swollen, relatively pale conjunctiva, the bulbar more marked than the palpebral. The symptoms and findings are less severe in the subacute type, which frequently is an expression or an exacerbation of the chronic type. The chronic variety is often seasonal and difficult to treat because it usually is caused by more than one allergen. The consensus, in general, regarding vernal catarrh is that it is seasonal in onset and allergic in symptomatology and appearance.

Phlyctenular keratoconjunctivitis is encountered less frequently than formerly but is generally regarded as an allergic manifestation to tuberculo-protein. Possibly food allergies and bacterial toxins act in some instances with the tuberculo-protein symbiotically. In luetic interstitial keratitis at birth the spirochetes in the cornea apparently sensitize it so that it is reactivated later by toxins formed when other syphilitic foci become active. Corneal ulcers, especially dendritic and superficial punctate, may circumstantially be of allergic origin.

Allergic episcleritis and scleritis, while frequently associated with other ocular

allergies, are most probably initiated by circulating allergens, the overlying conjunctiva being a protective cover. They present a difficult problem regarding identification of the responsible allergens and respond reluctantly to therapy. Sclerosing keratitis may occur and usually defies therapy, but tuberculin desensitization has aided in some instances when indicated.

Allergic manifestations in the uveal tract are more common than has been appreciated and range from the minimal seen in very mild iritis during low-grade upper-respiratory infections to the most severe sympathetic ophthalmia. Choroiditis of otherwise undetermined origin occasionally may be termed allergic by exclusion and a search should be instituted for the responsible allergen.

Woods and others have accepted Elschnig's theory that sympathetic ophthalmia is due to the antigenic activity of the uveal pigment of the injured eye, resulting in hypersensitivity especially in the uveal-tract cells of the fellow eye. Subsequent absorption of the pigment of the injured eye produces allergic reaction in the pigment tissues of the second eye. Sympathetic ophthalmia very occasionally has ensued subsequent to the occurrence of endophthalmitis phaco-anaphylactica. Rupture of the lens capsule, whether traumatic, spontaneous, or surgical, may result in diffuse intraocular inflammatory reaction because of allergy to lens matter, and these patients will give a positive skin reaction to lens protein, just as those with early or established sympathetic ophthalmia react to uveal-pigment skin testing.

Most patients with atopic dermatitis eventually develop lens opacities. As the lens is of ectodermal origin, many workers in allergy believe that severe allergic systemic reactions not infrequently are accompanied by the development of lens

opacities which are arrested as the reaction subsides.

There is much difference of opinion regarding allergies of the retina. Edema of the macula, retinal hemorrhages, and retinal detachments are reported as allergic manifestations, but it is difficult to understand the mechanism underlying retinal hemorrhages as a direct expression of allergy.

The treatment of allergy is notoriously unsatisfactory in many instances and there is no uniformly effective procedure. Adequate investigation is not always feasible and local treatment is the main reliance. Slightly acid buffer solutions afford comfort by lowering the increased pH of the tears and secretions. Local vasoconstrictors and cold afford relief, but astringents and antiseptics should be avoided. Specific desensitization should be performed where indicated in tuberculosis, brucellosis, and syphilis. Garretson's dictum should be borne in mind: "... obliteration of all toxic and psychic stresses, activation of endocrine function, chiefly thyroid and suprarenals, will cure symptoms of allergy. With normal adrenal content in the blood stream, allergic symptoms cannot occur."

#### THE ROLE OF STAPHYLOCOCCAL AND BRUCELLA INFECTIONS IN DEVELOPMENT OF AUTOSENSITIZATION

DR. EARL L. BURKY said that it has been shown that staphylococcal toxin can produce in rabbits sensitivity to rabbit lens and muscle. These results suggested that infection, under certain conditions, can produce autosensitization. This could not be verified experimentally until it was found that *Brucella* produced a low-grade ocular inflammation and lens sensitivity. These observations suggest that similar autosensitization states can develop in humans and that staphylococcal infections are responsible, particu-

larly in blepharoconjunctivitis with or without eczema elsewhere, for the production of autosensitization to some constituent of the skin.

Leon H. Ehrlich,  
*Secretary.*

## LOS ANGELES SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

### SECTION OF OPHTHALMOLOGY

October 23, 1944

#### PLASTIC CLOSURE OF DEFECT FOLLOWING ORBITAL EXENTERATION

DR. DEANE C. HARTMAN presented a case involving plastic closure of a defect following orbital exenteration which was complicated by an opening into the nasal cavity. He presented the patient and showed photographs which illustrated the original condition and deformity.

Mrs. L. B., aged 64 years, came to the clinic at White Memorial Hospital with a history of a recurrent tumor of the lower lid and inner canthus of the right eye, following several previous applications of radium during the preceding six years. Vision in the right eye was 20/25. Biopsy revealed that the lesion was a basal-cell carcinoma. The advice of the Tumor Board of the Hospital that complete exenteration be done was carried out to include all the contents of the orbit with the exception of the lacrimal gland and the outer one third of each eyelid. At the time of the operation it was necessary to remove the anterior ethmoidal labyrinth and lacrimal fossa, the frontal process of the maxilla, and the lacrimal bone as well as the anterior portion of the ethmoid labyrinth including the adjacent mucosal lining. A radium pack was inserted over the area.

When Dr. Hartman saw the patient for the first time there was a pyramidal-

shaped deformity, lined only with bone and having an opening  $2\frac{1}{2}$  cm. in diameter, which extended into the nasal cavity. The patient was very much annoyed and distressed by the frequent and painful dressings which were necessary.

Dr. Hartman discussed the several methods possible which might have been used to correct the situation. The most acceptable method, cosmetically, of advancing adjacent tissue was rejected because it offered no adequate lining and would cause distortion of facial expression together with uncertain healing due to tension. The second method, that of a free skin graft to the area, was also rejected because of insufficient thickness and lack of blood supply at the base of the defect. Poor resistance would almost certainly lead to infection and granulation.

Dr. Hartman chose to use a forehead pedical flap with the base and blood supply from the temporal area in front of the ear. The undersurface of the apex of the flap was lined with a free split-skin graft taken from the thigh one week prior to the transfer of the flap. Upon transfer the lined tip was placed over the opening into the nasal cavity and the base was allowed to rest in a gutter cut between the remaining portions of the eyelid at the outer canthus, so that no raw surface was exposed. The denuded area of the forehead was covered by a full-thickness skin graft taken from the abdomen. A pressure dressing was arranged so that each area received the optimal amount of pressure during healing. Cosmetically the appearance could have been improved by replacing a pedicle flap in its former position; however, the patient refused the last step because she was entirely pleased with the present condition. She wore a dark glass over the right orbital area and the appearance was acceptable.

Dr. Hartman closed his remarks with the reservation that although the plastic procedure is adequate, it is important to determine whether the tumor recurs or not.

#### HEREDO-MACULAR DEGENERATION

DR. ROBERT J. SCHILLINGER presented M. D., a man, aged 23 years, who complained of loss of vision at the age of 15 years. He had had several examinations and refractions without benefit, and no one had been able to explain his poor vision. During pre-induction examinations by the local draft board, he was accused of malingering.

Examination revealed no external pathologic change, no disturbance in the anterior segments or media, and no gross fundus findings at first glance. Careful examination of the macular areas, however, showed a ring of very dim yellowish-white foci resembling drusen around each macula. The macula, however, in each eye was normal. The optic discs and vessels were normal. There was no increase in intraocular pressure.

The vision was R.E. 20/100, L.E. 20/200. Visual fields were normal for form, but for color were greatly constricted, especially to green, and more markedly with the left eye.

In his discussion Dr. Schillinger brought out the known facts of this type of disease and discussed at some length the prognosis from information available in the literature.

C. H. Albaugh,  
*Reporter.*

## CHICAGO OPHTHALMOLOGICAL SOCIETY

November 20, 1944

DR. SAMUEL J. MEYER, *president*

#### AMBLYOPIA AND SUPPRESSION

DR. F. HERBERT HAESSLER presented a paper on this subject.

#### SOME SUGGESTIONS IN DIFFERENTIAL DIAGNOSIS OF MUSCLE IMBALANCE

DR. AVERY D. PRANGEN presented a paper on this subject.

#### CLINICAL MEETING

(Presented by the Department of Ophthalmology, University of Illinois)

#### KAYSER-FLEISCHER RING IN HEPATOLENTICULAR DEGENERATION

DR. HALLARD BEARD presented D. K., a man, aged 23 years, who came to the neurologic clinic complaining of trembling of the extremities, slurring or mumbling speech, and stumbling gait. This had been progressive for six or eight years. A diagnosis was made of hepato-lenticular degeneration (Wilson's disease) and the patient was referred to the eye clinic.

The corrected vision of both eyes was normal. The eyegrounds were normal. The ring-shaped area of 1 mm. of the circumference of the cornea in the posterior layers was the seat of a striking pathologic change, known as the Kayser-Fleischer ring. Its prevailing color was a golden or bronze color. As seen by the slitlamp microscope it was made up of innumerable fine brown dots or granules disposed about the periphery on or just anterior to the posterior surface. The deposit was heavier along the lower margin.

Among the significant physical and



laboratory findings were enlarged liver and mildly positive Pandy reaction in the spinal fluid. The nature of the corneal deposits was considered to be metallic (probably copper or silver) as metallic deposits are found in the viscera, notably the liver.

#### EXTERNAL OPHTHALMOPLÉGIA AND INCIPIENT CATARACT AS A RESULT OF NASO-PHARYNGEAL CANCER

DR. MARTHA RUBIN FOLK presented T. N., a man, aged 60 years, who was seen in March, 1944, complaining of severe neuralgia of the left eye, drooping of the upper lid of the left eye, and inability to move the eye in all directions. A similar neuralgic attack three years ago had been treated with X ray with relief of symptoms.

The vision with the left eye was 0.4. There was a partial ptosis of the upper lid and slight discoloration of the skin. The eye was slightly sunken. The lens showed a club-shaped, grayish opacity in the anterior cortex. The retinal vessels presented some arteriosclerotic changes. The pupil was 4 mm. in diameter and did not react to light. There was limitation of motion of the eye in all directions.

After a total of 40 X-ray treatments there was improvement as to pain and external ophthalmoplegia, with better movement of the upper lid and also in internal rotation. A cataract of the left eye appeared after the course of X-ray treatments. In some cases of nasopharyngeal malignant tumors, neuralgia and ophthalmoplegia may precede other symptoms. In this case the diagnosis of cancer was made by the Ear, Nose, and Throat Department.

#### ANGIOMATA OF LID AND ORBIT

DR. MARTHA RUBIN FOLK said that a 21-month-old boy was brought to the hospital in June, 1944, because of drooping

and swelling of the upper lid of the left eye which were noticed shortly after birth. No intelligent history could be obtained.

There was marked ptosis of the upper lid of the left eye and some difficulty in raising the lid for examination. Considerable hyperplasia was noted in the palpebral conjunctiva. A hard, cordlike blood vessel was palpable under the skin, extending from the outer canthus to the parotid gland. The left eye was down and in and did not follow movement of the right eye. There was 25 degrees of convergence with the perimeter for near. The pupil reacted to light and accommodation. No pulsation could be felt over the upper lid. X-ray pictures of the skull showed erosion and distortion of the outer table in the temporo-frontal region and rarefaction of the zygoma. Biopsy study of the upper lid showed an angioma with extensive edema and swelling of nerve fibers and inflammatory scarring.

On October 4, 1944, following treatment with radon seeds inserted into the eyelid, considerable regression of the lids was noted, and the temporal area had diminished in size to half the original finding. Lid surgery may be advisable when the child is older.

#### CAPILLARY HEMANGIOMA OF LID

DR. MARTHA RUBIN FOLK presented V. G., a 17-year-old boy, who was admitted to the clinic in November, 1943. At birth a small pea-sized cherry-red nodule was noted on the upper lid of the right eye. Following pertussis and pneumonia at the age of 3½ years, the nevus enlarged to the size of a walnut. Vision had been good except for mechanical impairment which caused ptosis.

There was a 4- by 5- by 3-cm. violaceous mass, verrucoid and polypoid, of the upper lid of the right eye with protrusion of the bulbar conjunctiva to the size of an almond. A bruit was palpable,

synchronous with the radial pulse: By contracting the frontalis and levator muscles the patient was just able to peer through the opening of the palpebral fissure near the inner canthus. Visual acuity was 20/20 in both eyes. Tension was normal. Both fundi were normal.

Biopsy study of the mass showed that it was a capillary hemangioma. Other laboratory studies were negative.

Ligation of the supraorbital, supra-trochlear, and branches of the superficial temporal vessel produced no result. Surgical removal was decided against, as the tumor was too vascular. In September, 1943, radon seeds were applied in a circular arrangement, followed by remarkable shrinkage of the mass to about one third of the original size, widening of the palpebral fissure, and disappearance of the bruit and protrusion of the bulbar conjunctiva.

#### CATARACT ASSOCIATED WITH NEURODERMATITIS

DR. MARTHA RUBIN FOLK said that a woman, aged 33 years, was examined in October, 1944. She complained of rapid loss of vision of the left eye, with preceding blurring of vision six weeks ago.

At the age of nine years, dermatitis appeared, with remissions. She had had the usual diseases of childhood: measles, chickenpox, diphtheria, and scarlet fever. She had developed hay fever 10 years ago. The family history showed that both grandfather and great-grandfather had suffered from a "skin condition" and cataracts which caused blindness. The mother had eczema of the hands.

The only physical finding of significance was dermatitis of the forehead, neck, arms, and feet. The vision was R.E. 1.0; L.E. light perception and projection. Ocular movements were normal, irides blue, pupils reacted to light and accommodation, and conjunctiva was normal.

The left eye showed anterior and posterior cortical opacities in the lens. A red reflex could not be obtained. The skin of the lids was dry and rough. Cataract extraction will be performed in the near future.

This patient showed an hereditary tendency from the mother's side, with a history of allergic manifestations since childhood.

#### RETINITIS PIGMENTOSA (FIELD PHASE)

DR. E. J. HORICK said that L. B., a woman, aged 42 years, complained of failing vision, especially at night. The past history was without significance except that she had had a double sympathectomy, cervical.

The vision was R.E. 0.6-2, improved to 0.8-1 with -1.75D. sph.; L.E. 0.5-2, improved to 0.8-2 with -1.00D. sph.  $\approx$  +0.75D. cyl. ax. 180°. The muscle balance was normal. Examination of the eyes was negative except for a classical retinitis pigmentosa.

The visual fields in this disease vary from time to time, and there are periods of improvement and regression. About 10 years ago double cervical sympathectomies were performed; however, it did not seem that the field variations noted had any relation to the operations. Over a period of five years the fields of vision had improved and had then become worse. In this disease ring scotomata are due in theory to changes in the retinal vessels.

#### MULTIPLE RING SCOTOMATA

DR. E. J. HORICK presented D. B., a 19-year-old girl, who was seen in April, 1941, complaining of diminution of vision, far and near, for two months. She gave a history of diphtheria and otitis media in 1928; rheumatic fever and carditis in 1938, with a good recovery; tonsillectomy during this period;

The vision was R.E. 0.2-1, corrected to 1.2 with +1.75D. sph.; L.E. 0.2-1, corrected to 1.5 with +1.50D. sph.

She could not read with these. Homatropine refraction was as follows: R.E. +1.50D. sph.  $\approx$  +0.25D. cyl. ax. 90°, vision was 1.2; L.E. +1.50D. sph.  $\approx$  +0.25D. cyl. ax. 90°, vision was 1.2; add +2.00D. sph., each eye. The patient was given bifocals.

The visual fields showed ring scotomata, and on seven occasions during the next three years were always in agreement. The media and fundi were normal. General medical and special neurologic examinations were negative.

In September, 1941, the patient returned, saying that near work had to be held too far away. The near point was 20 inches. The bifocals were changed to +2.75D. sph. add and there had been no complaints since.

The visual fields were an unusual and unexpected finding, in the absence of any retinal disease. There was no defect of light sense, no night blindness, no awareness of the scotomata. The scotomata were thought to be functional.

#### A. FAMILY OF SEMI-ALBINOS

DR. CARL APPLE showed four members of a family. The mother, aged 43 years, had five cousins with albinism and visual difficulties. The vision was R.E. 0.5-2, L.E. 0.8-3. The right eye tended to diverge when looking into the distance.

Homatropine refraction: R.E. +2.00D. sph.  $\approx$  +0.50D. cyl. ax. 180°; vision 0.8. L.E. +2.00D. sph.  $\approx$  +0.50D. cyl. ax. 90°; vision 0.8+.

H. D., a boy, aged 17 years, had a squint operation in 1943. The vision was R.E. 0.3, L.E. 0.3. The right eye diverged 35 degrees.

Homatropine refraction; R.E. +3.00D.

sph.  $\approx$  +2.50D. cyl. ax. 90°; vision 0.4-1. L.E. +3.00D. sph.  $\approx$  +0.50D. cyl. ax. 90°; vision 0.5+3.

B. D., a boy, aged 8 years, had alternating divergent strabismus of 25 degrees. He had had a squint operation in 1943.

Homatropine refraction: R.E. +3.50D. sph.  $\approx$  +2.00D. cyl. ax. 105°. L.E. +3.75D. sph.  $\approx$  +2.75D. cyl. ax. 90°.

F. D., a girl, aged 13 years, had a divergence of 20 to 25 degrees of the left eye. The vision was R.E. 0.5, L.E. 0.2+1.

Homatropine refraction: R.E. +3.00D. sph.  $\approx$  +2.00D. cyl. ax. 105°. L.E. +3.00D. sph.  $\approx$  +3.00D. cyl. ax. 90°.

#### COLOBOMA OF THE MACULA

DR. CARL APPLE said that M. C., a boy, had been in the clinic since the age of five years and was then placed in sight-saving classes at school. The left eye was microphthalmic, with 35 degrees of convergence. One muscle operation was performed in 1932. A cataract in the right eye was needled twice. There was marked nystagmus. A central, chorioretinal, heavily pigmented lesion was seen in the right eye, with pigment patches temporal to it. In the left eye there was a persistent hyaloid artery with choroidal degenerative changes.

In 1937 he had an attack of acute iridocyclitis in the right eye, and in 1939 a similar attack in the left eye which subsided in a few weeks. In 1941 the left eye again became inflamed, with the tension elevated to 43 mm. This was reduced with pilocarpine, but the pupil remained widely dilated.

Kahn test on both the patient and his mother gave negative results; the Mantoux test was also negative.

## MELANOSIS

DR. STEPHEN SIKUMLYN said that M.B., a white woman, aged 48 years, complained in September, 1944, of poor vision in the right eye, pigmentation of the right eyeball since the age of nine years, migraine, and tenderness of the right frontal sinus for the past three months.

The vision was R.E. 0.4, L.E. 1.5-3 without correction. Retinoscopy after homatropine showed R.E. +0.50D. cyl. ax. 40°, vision 1.2-3; L.E. -0.50D. sph.  $\approx$  +0.75D. cyl. ax. 15°, vision 1.2.

Routine laboratory tests and X-ray pictures of the sinuses showed no pathologic change. Slitlamp examination was negative. Ophthalmoscopic examination revealed no vitreous pathologic change in the right eye. The optic nerve was of normal pink color, round, the surface not elevated, the margins well defined except above, where there was slight blurring. Above the disc was a dark-gray pigmented patch of choroid extending upward for about 2 disc diameters, about 1 disc in width. There was a diffuse distribution of pigment in this patch except along the course of the vessels, where it was quite thin. Very thin flecks of pigment were seen in front of retinal vessels, but most of the pigment was deep to the retinal vessels. The periphery of the fundus temporally and especially in the lower quadrant of the temporal side was covered with numerous reddish, yellow, and white drusen. The fundus of the left eye was essentially negative.

Dignosis: Melanosis, retinochoroiditis juxta papillaris, and drusen. This was considered congenital in origin.

Robert von der Heydt.

## NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

November 21, 1944

DR. WARREN E. KERSHNER, *presiding*

## BACTERIOLOGIC OBSERVATIONS

MISS ANITA B. MANGIARACINE, bacteriologist at the Massachusetts Eye and Ear Infirmary, said that with the continued use of chemotherapeutic and antibiotic substances it was felt that an accurate bacteriologic knowledge of the infecting organism in cases of infection is essential in order better to treat the patient and to evaluate the drug. Routinely all cultures are set up aerobically and anaerobically, because it was found that about 50 percent of the strains of beta hemolytic streptococci and pneumococci can be first isolated only directly from the lesion, anaerobically. The smear is no longer used to establish a diagnosis of gonococcal infection. During the past year there have been 20 cases of meningococcal conjunctivitis, the smears on which showed intra- and extracellular gram-negative diplococci indistinguishable from gonococci. Because these patients can develop meningococcal bacteremia and meningitis it is important to make the diagnosis and to watch them carefully for complicating symptoms. One of the 20 patients, mentioned above, went on to a full meningitis and two to the bacteremic stage with beginning meningeal symptoms but no meningitis. Adequate chemotherapy averted this. The virulence of staphylococci is determined by the coagulase test. Virulent strains clot fresh human plasma and are toxin-forming; avirulent strains do not clot human plasma and do not form toxins. These are reported as coagulase-positive and coagulase-negative strains. As an example of the importance of differentiating between the two, the case of an infant was cited.

This child had a purulent conjunctivitis. Cultures showed a coagulase-negative hemolytic *Staphylococcus aureus*. Penicillin treatment was ineffective, so scrapings were examined for inclusion bodies. These were positive. The diagnosis of inclusion blennorrhoea was made, and sulfa therapy led to immediate improvement and subsequent cure. Strains of beta hemolytic streptococci are typed according to Lancefield groups. This is important because the groups which are not susceptible to the sulfa drugs are susceptible to the action of penicillin.

Miss Mangiaracine concluded her talk by stating that these findings briefly point out that an accurate knowledge of the infecting agent allows the physician to make a better selection of the drug to be used and to evaluate its efficiency.

#### NONSYPHILITIC INTERSTITIAL LESIONS OF THE CORNEA

DR. EDWARD E. COVITZ reported that Mrs. M. B., aged 29 years, was seen at the Massachusetts Eye and Ear Infirmary two years ago with the complaint of a red and painful left eye of one month's duration, accompanied by blurred vision. The vision was R.E. 20/40, corrected to 20/20; L.E. 20/200, unimproved. The right eye was normal. The left eye showed circumcorneal injection, with the upper half of the cornea opaque, gray in color, and there was no superficial nor deep vascularization. The tension was normal. Syphilis and tuberculosis were considered, but repeated tests were negative. Family and marital history were noninformative, and a thorough and complete physical examination was negative.

The patient was not seen for 18 months. At this time she stated that the left eye had become blind six months previously, had been constantly painful ever since, and had affected the other eye, causing it to tear and blur. The right eye was not

inflamed. The cornea was clear, tension and media were normal. Visual acuity was 20/20. The left eye was pale, the cornea totally opaque and light gray in color. Details in the anterior chamber were not visible. The tension became elevated, and light projection was faulty. Due to the patient's discomfort and hopelessness of ever obtaining useful vision, the left eye was enucleated in April, 1944. The pathologic report was lipodystrophy of the cornea. The interior of the eye was normal. There was no evidence of uveitis or iritis. The retina and disc were normal. The cornea was involved most markedly in the central portion. Bowman's membrane was intact. In the anterior sixth of the corneal stroma there were numerous calcific granules. There were cholesterol crystals and cells distended with lipoid granules. None of these deposits were immediately beneath Bowman's membrane. They were separated from it by newly formed, highly cellular fibrous tissue. The portion of the cornea just in front of Descemet's membrane was completely normal and free from infiltration, but the central part of the cornea was markedly infiltrated with chronic inflammatory cells and the stroma was replaced by vascularized fibrous tissue. There were no foci suggestive of tuberculosis or Boeck's sarcoid. A few Langhans cells were seen, although many of the cholesterol crystals were involved by giant cells, and after prolonged searching two giant cells were found elsewhere in the cornea. In May, 1944, the right eye began to have periodic attacks of slight ciliary injection and for the first time the cornea presented grayish infiltration at the periphery. Gradually this infiltration encroached upon the central area, and in September, 1944, the patient was admitted to the Massachusetts Eye and Ear Infirmary for further studies. Basal metabolic rate, blood calcium, blood cholesterol, blood phosphorus, and phosphatase tests

were made, and all were found to be within normal limits.

Duke-Elder, in discussing fatty degeneration of the cornea and lipodystrophy, states that in rare cases it may be due to an excess of lipid materials in the blood. In the usual case the fat deposit is an uncontrolled accumulation due, in part, to faulty fat metabolism and in part to the deposit in visible form by degenerating cells of fat material normally held by the cell in invisible form. Fatty degeneration of this nature may occur secondarily or primarily; the first follows obvious damage to the cells and is not uncommon; the second, true lipodystrophy, is of an obscure nature, rare, and never presents the picture of an inflammatory disease. In short, this case clinically is the picture of secondary fatty degeneration of the cornea, and pathologically the picture of primary or lipodystrophy of the cornea.

#### PRELIMINARY REPORT ON BILATERAL SURGERY IN ALTERNATING STRABISMUS

DR. ALBERT N. LEMOINE, JR., said that because unilateral surgery—namely, recession—resection in one eye—had failed to give uniformly good results bilateral surgery was decided upon in a series of patients with alternating strabismus. Dur-

ing the past 11 months there have been 28 patients who have had bilateral surgery and an adequate follow-up. The pre-operative work-up consisted of a refraction; measurement of the strabismus with prisms at distance and near, with and without glasses; the near point of convergence, with and without glasses; the screen concomitance test; measurement of the deviation in the diagnostic positions of the gaze. From these objective data the cases were placed in diagnostic groups before surgery. Following surgery, the patients' uncorrected deviation was measured again after one, three, six, and nine months. At the time of this preliminary report, 20 of the 28 cases showed a good result. By a good result was meant that the patient on the last visit had 10 or less prism diopters of remaining strabismus, with or without glasses and/or simultaneous macular perception as demonstrated with a red glass before one eye. Dr. Lemoine said it was, of course, too early to make a definite statement as to the ultimate results but thus far bilateral surgery in alternating strabismus had yielded encouraging results.

Mahlon T. Easton,  
Reporter.

# AMERICAN JOURNAL OF OPHTHALMOLOGY

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## COLONEL VAIL RETURNS AS EDITOR-IN-CHIEF

October, not January, should bring in the New Year for those of us who live in the north temperate zone. The greatest change of the year takes place then. Summer with its vacations, slower tempo, long lazy days, and open windows and doors is past. A tang courses in the air, schools reopen, a new zest enters our spirits, and we resolve that this year we shall do great things. We will rearrange our offices, start that research about which we had dreamed in the summer, and write that article that we have been postponing from year to year.

This fall the situation is somewhat different. A deep peace has entered into our souls. A glow of quiet happiness prevails. The war is over. The hectic period is past. Practice will soon be shared with those who answered the call to service, medical schools will drop their speed-up programs, and we may relax a little. "We shall rest, and faith, we shall need it, Lie down for an eon or two." But although most of us will be happy to have the pressure reduced, we have caught the habit of acceleration and can perhaps carry some of that over into greater accomplishments in our profession.

One of our duties that should be pleas-

urable is welcoming the ophthalmologists returning from service. Any who had a similar experience after the first World War will never forget the let-down feeling that follows so quickly the exhilaration of being home again and in civilian clothes. The practice that we thought was a pretty good one when we went away seems to have almost or quite disappeared. Our patients have gone elsewhere and only a few, God bless them, come back to us. So few seem even to know that we have been away. It is all a bit discouraging, but this feeling can be greatly alleviated by friendly and helpful colleagues. Let us try to make them feel our gratitude for having made this very great sacrifice for us.

Most ophthalmologists will return to take up where they left off. This is true, in so far as it concerns the American Journal of Ophthalmology, of the editor-in-chief, Colonel Vail. However, even in his case there will be the difference that his office will be moved to Chicago. With him, however, will go our loyal and efficient manuscript editor, Miss Emma S. Buss, without whose help during the past three years of Dr. Vail's absence the writer would have been unable to carry on the Journal. Since she joined the Staff, some thirteen or fourteen years ago, she has been an indispensable aid, and through the war years, when the acting editor was swamped with other duties, she has carried on almost alone.

A sincere tribute must be paid to the associate manager also, Miss Lucille Fromme, who has conducted the business of the Journal most efficiently in Cincinnati, so far removed for the past three years from the immediate help of the acting editor.

Colonel Vail's first two years as editor-in-chief showed his fine capabilities in that position. His three service years as Chief Ophthalmological Consultant to our

army overseas will have given him the broadest possible viewpoint. Following induction and a brief preparatory period in this country, Colonel Vail was sent to England, where he was responsible for ophthalmic services in Army medical installations and where he became acquainted with the leading ophthalmologists of that country and observed the ophthalmologic techniques of the British Army that had already been at war for several years. He inspected all of our ophthalmologic units and advised with the Surgeon General's Office as to changes that might advantageously be made. He made a surprise visit to the United States in October of 1943, at which time he added much to the pleasure of the meeting of the American Academy of Ophthalmology and Otolaryngology, where he took his place in the Council. Returning to England after a few weeks in the country, he was there at the time of the invasion of France. Shortly afterwards he went across to oversee the establishment of the ophthalmic units in the Army of Invasion which covered all of France and Belgium, the German border, and England during that period. In charge of the spotting and placement of the mobile optical units, he was close to the front at times and thus became familiar with the immediate as well as remote ophthalmic service to the injured. He returned home to help in planning the rehabilitation of service men with ocular casualties and interested himself officially in the program for the war-blinded. At the end of 1944 he became Chief Ophthalmic Consultant to our forces in this country and was succeeded overseas by Lieutenant Colonel James Greear, who had been in charge of ophthalmologic rehabilitation at the Valley Forge Hospital.

In January of this year Colonel Vail resumed a part of the duties of chief editor of the Journal and is now ready to



take full charge. After much deliberation he decided that he would leave his home in Cincinnati, where he had succeeded his distinguished father and had established an enviable reputation for himself, and accept the appointment as Professor of Ophthalmology on a part-time basis at Northwestern University Medical School, as offering greater opportunities for teaching and research. To make this decision must have required great courage, for anyone who has built up a large practice knows what effort this has required and how long it has taken, and to abandon it for an ideal is not easy. Nevertheless, every man who has a large practice knows how its octopuslike tentacles seize and hold him fast. Year by year it becomes harder to find time for teaching and research. His obligations increase and he is unable to do without the increased income that the larger practice brings. About one man in a thousand has the courage to let the larger viewpoint prevail.

The once-more-retiring editor congratulates Colonel Vail and in welcoming his return as editor-in-chief on active duty with the Journal looks forward to a better publication that will attract an ever-increasing number of readers and contributors.

Lawrence T. Post.

#### A REVIEW OF SOLAR RETINITIS AS IT MAY PERTAIN TO MACULAR LESIONS SEEN IN PERSONNEL OF THE ARMED FORCES

The question of increased incidence of macular lesions in service personnel has been eminent in the minds of military ophthalmologists since the war began. Analyses of some of the cases have been presented recently by Cordes<sup>1</sup> and McCulloch.<sup>2</sup>

As these authors emphasize, the etiol-

ogy of many of these macular lesions is not certain. There is no doubt but that a great part of the increase in incidence observed is not real but made apparent only by the frequent screening examinations done in the services. For instance, McCulloch found 7 instances of old eclipse burns in 1,000 routine examinations. The writer has seen 5 old eclipse burns during two months of routine examinations in an Air Corps Regional Hospital Clinic where approximately 2,000 new patients were seen. Many patients are examined who ordinarily would not seek ocular advice. It is not uncommon to find service men with small macular holes, having 20/20 to 20/30 vision in the involved eye. These patients are frequently unaware of any abnormality until they are subjected either to use of their eyes under unusual conditions, or to special examination intended to demonstrate a minimal scotoma.<sup>2</sup> Such conditions of unusual use of the eyes would include sighting through a small aperture, as with a range-finder, gun, sextant, or microscope. Most annoying to the examiner seeking the etiology is the lack of awareness on the part of these patients as to the time and circumstances of onset of the lesion.

The common causes of macular disturbances in this age group are: familial macular degeneration; solar retinitis; trauma, as contre coup injury; bacterial, toxic, and allergic factors including idiosyncrasies as might occur after inoculations; and finally angiospastic retinopathy. It seems conceivable that any of these conditions might have produced a small macular lesion, the subjective symptoms of which were slight and of short duration, the original cause often being forgotten, particularly if the condition occurred at an early age. All ophthalmologists have seen minimal lesions in patients who, only after careful question-

ing, admitted having looked at an eclipse or having suffered a blow to the eye followed by a definite scotoma, but who had quite forgotten the attendant circumstances until reminded of a possible relationship. Of particular importance to military ophthalmologists is the possibility of magnifying, in the patient's mind, a preëxistent minimal lesion by repeatedly calling attention to it in successive examinations until the patient appreciates it as grounds for avoiding unpleasant duty.

With recent lesions one would expect the patient to remember the onset of a scotoma and circumstances preceding it. Exceptions would be in cases with an extremely insidious onset, as occurs in certain degenerative conditions or might occur with a subclinical injury cumulative in nature.<sup>3</sup> The history is then only a guide for differentiation of service-connected lesions from those existing prior to entrance into the service.

An especially interesting and significant group of cases would be those with macular lesions associated with an indefinite history of onset in personnel known to have had careful and complete qualifying physical examination. This would include certain groups of officers as pilots, bombardiers, navigators, and others, and would indicate more significantly the frequency of occurrence of degenerative lesions or cumulative subclinical injuries occurring in service. As yet there has been no general cataloguing of cases in a way that emphasizes particular etiologic groups. Cordes<sup>2</sup> has started such a correlation and evaluation of cases with Navy ophthalmologists and concludes that there is one group definitely related to angiospasm.

In addition, Cordes briefly discusses solar retinitis. Although a lesion on this basis may appear clinically to be extremely variable, it nevertheless lends itself readily to critical analysis, a situation not

generally appreciated in its entirety. For this reason, and because the circumstances of modern warfare might lead to an increased incidence of solar retinitis, the subject is reviewed. It is reasonable to assume that excessive exposure to radiation occurs in gunners, navigators, aircraft spotters, and those fighting in the tropics or where there is constant reflected glare from water or sand or snow, or in extreme cold or at high altitude where radiation is intensified.

HISTORICAL (Taken in part from the review by C. B. Walker<sup>4</sup>)

This syndrome has been described under various synonyms of eclipse blindness, retinal dazzling, scotoma heliæclipticum, retinal solar erythema, solar retinitis, and the like. That blindness may result from direct observation of the sun of eclipses has been known, without doubt, for ages. Galileo is known to have injured his eyes by observation of the sun with his telescope. Galen recites cases of blinding with more or less subsequent return of vision in observers of eclipses of the sun. He also noted that central scotoma or blind-spots often resulted in the same way. Reid, in 1761, and Soemmering, in 1791, probably gave the first accurate descriptions of the phenomenon of sunblinding. Less frequently, but of more importance to the present discussion, the same ocular disturbances have long been noted in seamen exposed repeatedly to strong reflection of the sun's rays from water surfaces, as when a small boat is being steered into the sun's "eye," or to the brilliant reflection of light into a sextant in which the eyepiece has not been darkened. Travelers over desert sands or glary plains are not uncommonly afflicted with visual disturbances. Elliot<sup>5</sup> reports a case of typical solar retinitis, indistinguishable from that met with in eclipse patients, in a patient who on one occasion had to

ride for several hours in the early morning alongside of paddy fields "lying under water with the sun strongly reflected from them onto his left eye."

A different type of lesion from the sun's rays is described by Jess<sup>6</sup> and by Zade.<sup>7</sup> Zade found, in World War I, in five of nine aviation officers and in a large percentage of anti-aircraft gunners, a ring scotoma extending 35 to 50 degrees from the fixation point and only a few degrees wide. In 150 cases of "dazzling" in the regular army Zade found no scotoma, whereas in 160 cases in the aircraft service 31 showed scotomata. These were found mostly in the crews of anti-aircraft gunners. The scotomata were peripheral and in the lower fields. To date these findings have not been corroborated in the present war.<sup>8</sup>

#### EXPERIMENTAL (Quoted freely from the monograph by Verhoeff *et al.*<sup>4</sup>)

Czerny, as early as 1876, showed that a lesion of the retina of the rabbit, visible with the ophthalmoscope, could be produced by the sun's rays. By using a concave mirror and glass-lens system he concentrated sun's rays which had traversed a 20-cm. water-heat-filtering tube into the eye of a rabbit for 10 to 15 seconds. The region of the retinal image on exposure was found to be whitened and seared. Section under the microscope showed what he described as a coagulation of the albuminous substances of the retinal elements. Deutschmann, in 1882 using a convex lens to transmit the sun's rays reflected from a concave mirror, separated the distance between the two so as to equal the sum of their focal lengths and so was able to throw parallel light into the atropinized eye of the rabbit and produce a typical lesion even after a few second's exposure. To determine the influence of heat he passed the rays through a tube of clear running water 20 cm. long. The

changes could be produced but it always took a few minutes longer. He concluded that both heat and light were active as etiologic factors. This analysis of heat and light effects has subsequently been disproved. Later, other workers attempted to determine which part of the spectrum was responsible in producing the lesion. Widmark (1892) studied the effects of ultraviolet light on the retina and found no significant retinal lesions. Aubert (1900) was inclined to disregard the heating effects in sun-blinding, since he found that a thermometer held in sunlight concentrated by a 40-diopter diaphragm lens only registered 1 to 2 degrees' increase in temperature. Hertzog (1903) produced lesions in rabbit's retina which he ascribed entirely to heat. Birsch-Hirschfeld, in 1909, repeated Aubert's experiment and then showed that 50-degree paraffin, in thin layers on black paper, when exposed to sunlight, as retina would be in sun-blinding, melted in a few seconds; but when white paper was used under the same conditions several minutes were required to melt the paraffin, thus demonstrating simply the production of heat from absorption of light rays by black retinal pigment. This emphasized the fact that light must be absorbed to be effective. Presumably Aubert's thermometer either reflected or transmitted enough of the sun's rays that absorption was insufficient to raise the temperature.

It remained for Verhoeff and Bell<sup>4</sup> to give us the most complete understanding of eclipse blindness in their classical monograph on effects of radiation on the eye. A small part of this monumental work was devoted to experiments artificially producing eclipse blindness in animals and examination of the lesions produced with special reference to the kind and intensity of radiation required to produce the lesions noted.

By using various means of focusing the

sun's rays into the eyes of rabbits and monkeys, plus the use of artificial sources of light, and of various filters and absorbing media to break down the spectrum into its components, they conclusively proved that "the effects known as eclipse blindness are wholly thermic, due to the intense concentration of the solar energy upon the retina by the refracting system of the eye itself, forming an image of destructive intensity." Approximately  $113 \times 10^6$  ergs (approximately 4 calories) per square centimeter per second was calculated to be the concentration of energy in the image when looking at the sun un-screened. Even if only one half or one fourth of this amount of energy were available, as in the case of a partially eclipsed sun, the immense concentration of energy in the image would still be sufficient to produce destructive effects. Experiments by Eccles and Flynn<sup>9</sup> demonstrated that retinal lesions usually occur when radiant energy falls on the retina for 30 seconds at a rate of 70 calories per square centimeter per minute, but not when the rate is 40 calories per square centimeter per minute. There is rough quantitative agreement between their results and those of Verhoeff.

The effects were not the result of abiotic damage due to the ultraviolet end of the spectrum since the experiments of Verhoeff proved that insufficient ultraviolet light reaches the retina to do any immediate harm. The cornea obstructs practically all energy of wave length less than 295m $\mu$ . and the lens the remaining ultraviolet to wave length 380 to 400m $\mu$ . They were not the result of the infrared end of the spectrum, since the energy in this region of the solar spectrum is low and reaches the retina only in part, insufficient to produce heat enough to cause damage. Up to the present time no one has shown that the infrared radiation has any effect on tissue other than heat, and

the small band of infrared starting at the end of the visible spectrum, 760 on up to 1,200m $\mu$ . where it is entirely absorbed by water, could supply but a small amount of energy.

There remains then the energy of the solar spectrum, the greater part of this energy lying within the visible spectrum (760 to 400m $\mu$ .), which traverses the media of the eye and the retina to be absorbed in the pigment and there degraded into heat sufficient to produce a destructive lesion, distinguishable under the microscope from an abiotic lesion. This lesion spreads in both directions, forward through the retina into the rods and cones, and backward into the choroid.

The concentration of energy in images, as on the retina, obviously depends on the amount to which superficial energy is concentrated by the refractive media, and by the size of the aperture of the refracting system, determined by the size of the pupil. If the source of energy is extended as in reflection from large surfaces, as sea or desert, the image is correspondingly extended and the concentration of surface energy in the image is correspondingly reduced. Contrariwise, if the source is small the image density is relatively greater. Within limits then, intensity of effects on the retina is directly proportional to the intrinsic brilliancy or radiation per unit area of the source.

Aschkinass has shown that the general absorption of the media of the eye for radiant energy is closely similar to that of water in a layer of equal thickness. Whereas the cornea and lens absorb the rays of ultraviolet light the water content of the eye absorbs the greater part of the infrared radiation, and only the waves from the visible spectrum traverse the eye to the retina, longer wave lengths being more than 90 percent absorbed. Consequently, radiation from low-temperature sources, like carbon incandescent

lamps and ordinary flames, is practically absorbed before it reaches the retina. It is quite different, however, with radiance like that from the sun, which is equivalent to that from a body 5,500 to 6,500 degrees absolute as regards the character of its radiation. From such a source the specific absorption of water cuts off relatively little and the total loss of energy in the eye is in the order of magnitude of 25 to 30 percent. In phenomenon like eclipse blindness not only is the eye exposed to a powerful radiation source but the radiation is of such a character that it is not absorbed and hence the energy in the image may rise to great intensity.

From their experimental data Verhoeff and Bell<sup>4</sup> calculated that the critical period for development of eclipse blindness is, with close fixation, of the order of magnitude of a minute or less and exposure of even a few seconds would be highly dangerous were it not for the extreme miosis (pupillary diameter 1.6 to 2 mm.) set up when looking at the sun, and the wandering of the image on the retina. Rapid shifting of the focal image on the retina gives the tissue opportunity for cooling, so that if fixation at a certain point is not long enough to produce destructive effects little permanent damage can be done, although the scotomata may be severe.

#### HISTOPATHOLOGY

In rabbits the spots produced by sunlight were about 2.5 mm. in diameter as measured under the microscope with reference to the effects on the pigment epithelium, but only about 1 mm. when measured with respect to the effects on the retina proper when this was involved. The most striking features of all the burned areas whether due to short or long exposures was their sharp demarcation indicating how sharply critical is the temperature required to injure tissues.

The pigment epithelium was the most severely injured of any portion of the retina, and in the slightest burns it alone was affected. The rods and cones, choriocapillaris, and outer nuclear layer were affected in this order. The inner nuclear layer, the ganglion cells, and the nerve-fiber layer were affected only after extremely intense exposures, and in the experiments were not affected after exposures to the magnetite arc but only when concentrated sunlight was used. The layers of the retina were disintegrated or coagulated depending on the degree of heating. Two months after exposure the retina was found replaced by neurogliae containing wandering pigment cells. In some cases the choroid was apparently normal and the pigment epithelium reformed. In others the latter was absent and the choroid replaced by two or three layers of fibrous vascular tissue. It is to be noted that the extreme effects produced experimentally in the rabbit would only rarely, if ever, be encountered clinically in man, for the light was concentrated by use of a concave mirror, transmitted through a dilated pupil, and the time of exposure longer than would occur clinically.

#### PATHOGENESIS

To recapitulate, it is seen that the sun's rays have no effect unless they are absorbed. This absorption does not take place in the eye until the retinal pigment is encountered. Here the light is absorbed and converted into heat which may be sufficient to injure only the pigment epithelium or may extend both forward and backward to injure the choriocapillaris or neuroepithelium and inner retina. However, the width of the lesion is nicely demarcated owing to the fact that the critical temperature necessary to injure tissue is definite and the heat is concentrated in the center, owing to the nature

of the image, and is dissipated rapidly from the periphery through the circulation.

The length of exposure causing injury when one looks at the sun is calculated to be in the neighborhood of a few seconds.<sup>4</sup> Eccles and Flynn<sup>5</sup> from their experiments on rabbits conclude that momentary glances across the sun will not produce retinal lesions. Results of exposure under diverse conditions would vary according to the time necessary to develop heat effects. Looking through a glass or filter or exposure to reflected sunlight or other sources or radiation as arc light, incandescent metals, and so forth, will damage the retina only if the effective amounts of heat are generated. Eccles and Flynn<sup>5</sup> showed that effective amounts (70 calories per square centimeter per minute) were received by the retina through a 2-mm. pupil in 30 seconds, causing demonstrable lesions, whereas ineffective amounts (40 calories per square centimeter per minute) were received through a 1-mm. pupil in the same length of time, causing no demonstrable lesions. It is quite possible, then, for so-called "protective" glasses to allow dilatation of the pupil to the point where radiation received by the retina is actually greater than it would be without the glasses because the absorptive qualities of the lens do not compensate for the amount of radiation transmitted through the increased pupillary aperture. No doubt many macular burns have been sustained under such circumstances of false sense of protection.

Because of the retinal circulation, heat generated in the retina does not accumulate, and, therefore, repeated exposures, each producing rise in temperature below the point at which injury to the tissue occurs, would have no effect even though repeated many times. Verhoeff's experiments indicate that as far as the retina is

concerned heat effects alone follow exposure to solar radiation. He shows that all the ultraviolet and most of the long infrared radiation is absorbed before reaching the retina. More recently Duke-Elder<sup>10</sup> cited experiments in which retinal changes were produced by severe exposures to ultraviolet light. His interpretation was that repeated subcritical amounts of ultraviolet radiation might produce cumulative pathologic effects. The 150 cases of macular lesions reported by Smith,<sup>3</sup> and believed by him to be instances of solar retinitis, occurring in the South Pacific, are interesting from this point of view. The possibility of photosensitizing substances being present in the circulation and retinal tissue and/or undue sensitivity, as allergy, to certain rays, thus allowing greater effect from radiation than would ordinarily be expected, must also be considered.

#### CLINICAL DESCRIPTION

The clinical picture of solar retinitis recorded in the literature seems to be extremely variable and incongruous, but the preceding consideration of the pathologic lesions produced experimentally explains this apparent variation and makes it quite understandable. The immediate signs and symptoms, varying from marked to negligible changes, depend entirely on the nature of the exposure as to time and severity, pupillary size, and overlapping fixation. Cumulative effects from repeated exposures must be considered to be in the realms of possibility if effects from radiation other than those attributable to heat are ultimately proved to occur in the retina.

It remains for us to set up a clinical picture and diagnostic criteria consistent with the clinical findings in known cases and with the experimental pathologic changes so as to determine which will be

important in differentiating solar retinitis from other macular lesions.

These criteria are:

1. **SCOTOMATA.** (a) *Acute stage.* Immediately following exposure there is a sharply defined positive central scotoma which may be severe but is characteristic in the rapidity and extent of its clearing. For instance, patients are often not concerned about the scotoma, believing that it will go away in a few hours, and when they awake the following day and a scotoma is no longer noticeable the episode is easily forgotten. Frequently patients will not report to an ophthalmologist for three or four days after exposure, being concerned only when the scotoma persists. The question of peripheral scotomata, 20 to 50 degrees out<sup>11</sup> has not been corroborated generally but should be looked for in the future.

(b) *Late stage.* In the late stage an extremely minute central or paracentral or no scotoma persists. Vision usually varies from 20/70 to 20/50 or is normal. The scotoma is negative and may require special techniques for its demonstration, such as the use of blue test objects at 2 or 3 meters' distance and a mirror or prism apparatus to separate the visual lines between the two eyes so that the good eye may be used for fixation while the affected eye is tested for the scotoma.<sup>2</sup> There is rarely complete loss of central vision. Even in cases presenting an actual hole in the macula one may have 20/20 vision but complain of the fixated image, as letters on the test chart, disappearing, especially if sighted through a small aperture. Of course, this is characteristic of a small scotoma of any origin.

2. **OPHTHALMOSCOPIC PICTURE.** In general the ophthalmoscopic picture shows a localized lesion varying within small limits in its diameter but with more variability as to its depth, understandable from the

fact that it starts in the pigment epithelium and spreads forward and backward depending on the intensity of the heat. The confinement of the lesion to such a small radius, the adjacent retina being unaffected, as well as the absence of injury to other parts of the eye is a distinguishing feature. Other macular disturbances are seldom so completely localized.

(a) *Acute picture.* Theoretically and experimentally this may show extremes in the depth and severity of the injury as varying from a practically normal macula to one which shows a white seared fovea with hemorrhages. The latter, although possible, would be most unusual. The usual degree of involvement reported clinically, as in Birch-Hirschfeld's<sup>12</sup> 50 cases of acute eclipse phenomena, is a macular area, grayish and opaque, with veiling of the details and an intensifying of the pigment granulation. The foveal reflex is usually enlarged and sometimes there are some minute whitish spots in the damaged zone. In deeply pigmented fundi<sup>13</sup> a maroon or bronzed to crimson zone around the fovea is described, irregular in shape but sharply edged, often surrounded by pigmentary disturbances described as a "smoke-cloud" appearance. Mild hyperemia of the disc has frequently been noted and would be expected as a change secondary to the retinal injury.

(b) *Late stage.* At this stage changes vary from a slight plaquelike depigmentation of the foveal area, which may or may not be mottled, to a hole in the retina with minor pigmentary changes surrounding this. The light reflex may be altered and often appears to be replaced by one or two yellow spots which differ from the light reflex in that they are most distinct when focused at the retinal level and do not move with movement of the ophthalmoscopic light.<sup>2</sup>

3. **EYE INVOLVED.** Involvement of one

or both eyes depends on the circumstances under which exposure takes place. In Wright's<sup>13</sup> series of 21 cases of eclipse amblyopia, seen 1 to 31 days following exposure, both eyes were involved in 15 instances, whereas under circumstances wherein a monocular instrument is being used only one eye would be involved.

4. COURSE. The unlikelihood of remissions and exacerbations of symptoms of scotoma in solar retinitis in contradistinction to macular lesions from angiospastic phenomenon is of diagnostic significance. Recurrence or progression are conceivable on exposure to radiation only if one assumes that cumulative effects are possible. As yet the evidence against this assumption overbalances that in its favor.

To summarize: the diagnosis of solar retinitis can be made in the presence of a sharply demarcated, small, nonprogressive, nonrecurrent lesion of the macula in an eye in which there is no evidence that the causative agent has produced any other lesion; in an individual giving a negative history of concussion injury, a negative family history for macular dis-

ease, and a positive history of exposure to excessive radiation.

Treatment is mainly preventative and in the Armed Forces this could be accomplished by orientation courses regarding the effects of radiation on the eyes and how to use the eyes to avoid excessive exposure, and by the use of protective devices under circumstances wherein damage by radiation is imminent. Such protective devices for use where it is necessary to look into the sun would be glasses with high absorption powers for both visible and infrared radiation, for example, welder's glasses conforming to accepted specifications of the American National Bureau of Standards.

No doubt of all the macular lesions seen in the Armed Forces, solar retinitis constitutes but a small percentage. Nevertheless, it forms a characteristic group that can be rather definitely diagnosed, and for this reason the pathogenesis and character of the lesion have been reviewed.

S. RODMAN IRVINE  
Major (MC)

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- <sup>11</sup> Loewenstein, A., and Steel, J. Glasgow Med. Jour., 1941, v. 17, March, p. 73.
- <sup>12</sup> Birch-Hirschfeld, A. Zeit. f. Augenh., 1912, Aug., p. 324.
- <sup>13</sup> Wright, R. E. Amer. Jour. Ophth., 1923, v. 6, Oct., p. 1.

#### RETINAL AND GENERAL CIRCULATION

Very early in the development of the human embryo, the elements from which will later arise the optic nerve and retina

are demonstrable as a part of the fore-brain. The optic pits, minute depressions in protrusions of neural ectoderm at the front end of the neural plate, are symmetrically paired from the time of their



original appearance, one on each side of the neural groove, at "that portion of the upper surface of the head fold which is in direct contact with the surface ectoderm" (Mann: "Development of the human eye"). This pairing of the optic pit is cited as opposing the suggestion that the eye was originally median, or cyclopic. The proximity to the surface ectoderm is of course important in relation to subsequent formation of the crystalline lens.

A little later, the optic pit develops into the optic vesicle, the invagination of whose lateral (subsequently anterior) half into the median (later posterior) half forms the optic cup, the two halves of which constitute, respectively, the pigment layer and the neural layers of the retina.

Thus the optic nerve and retina are essentially a part of the brain. Their blood vessels, like other blood vessels, are derived from the embryonic mesoderm. Their arteries share with those of the rest of the brain the distinction of being end arteries, ordinarily free from anastomoses. This is a fact of vital importance as to the devastating effect of arterial obstruction.

Apart from biomicroscopic study of the conjunctival circulation, ophthalmoscopy affords the only opportunity to view under considerable magnification the condition and behavior of living human blood vessels. Perhaps even more important is the fact that with the ophthalmoscope we view a part of the cerebral circulation. Circulatory changes in disease do not always involve uniformly all parts of the brain, including the optic nerve and its retinal expansion. But vascular changes in the retina are always significant or suggestive in study of the disease processes which involve or may involve the brain.

Among important recent writers on retinal circulation, it is probable that none has contributed more to our intimate

knowledge of the subject than Bailliart. Let us recall that this author was a pioneer in the measurement of retinal arterial and venous tension. His ophthalmodynamometer was presented in 1917. With Magitot he proceeded to set up curves by means of which the tension could be calculated in relation to the point where pressure upon the eyeball caused first the appearance, and later the disappearance, of arterial pulsation.

Prior to the outbreak of the recent world upheaval, Bailliart's most comprehensive review of his own work and the work of others in this field was the official "report" presented to the Cairo Congress of Ophthalmology in December, 1937 (*"L'hypertension artérielle rétinienne,"* XV Concilium Ophthalmologicum, Cairo, 1938, volume 1, page 87). To the same Congress were presented, also as official "reports," a study by Wagoner and Keith on "Diffuse arteriolar disease and hypertension," and one by Koyanagi entitled *"Veränderungen an der Netzhaut bei Hochdruck; pathologische Anatomie."*

An interesting first-fruit of the end of the war with Germany is the recent receipt of a series of issues of *La Presse Médicale*; one of the world's oldest and most respected weeklies (pre-war, twice weekly). Most of these numbers were published during the German occupation of Paris, a few of them after the precipitous German retreat. In the issue of November 18, 1944, Bailliart published a picturesquely written article entitled "The prognosis of arterial hypertension judged according to some retinal aspects."

Bailliart reminds his readers that, alike for ophthalmologists and for other physicians, the structural and functional condition of the central artery and vein of the retina—"veritable cerebral vessels"—is at least as interesting as that of the humeral or the radial artery. In this short essay he raises the important question

whether the retinal tree may not furnish evidence as to the part played by peripheral resistance in the origin and maintenance of that arteriolar disease which, in the opinion of Wagener and Keith, is the cause of hypertension.

The patient with general arterial hypertension is seldom entirely free from vascular accidents involving the retinal vessels. The exact significance of these retinal signs, as affecting general prognosis, may not always be clear. Yet even slight edema of the optic disc may correspond to a similar condition within the brain. Thrombotic occlusion of a retinal vein may be the first manifestation of apoplexy.

"Receiving the blood under abnormal pressure," says Bailliart, "the capillaries at first resist the surcharge by contraction of their walls; they absorb a part of the pressure . . . In the long run, if unaffected by obliteration, they yield and dilate; thenceforward the blood column . . . forces the extensible veins; the blood stagnates, blood elements and plasma escape; the retina, in a blood inadequately renewed, is inadequately nourished." To find such a condition in the retina is to know that it may develop elsewhere in the cerebral vascular network.

It is important to remember that in serious cases of vascular hypertension the diameter of the retinal arteries may appear normal although their caliber is greatly reduced. In biopsy of the arterioles of the pectoralis major muscle, Wagener and Keith have shown that, while the thickness of the vessel wall is normally equal to one half the caliber, the relative measurements are inverted in severe forms of hypertension.

Certain measurements quoted by Bailliart in his Cairo "report" are worthy of repetition. The only vessels ophthalmoscopically visible are arterioles. With rare exceptions near the macula the capillaries

are invisible, because they turn at right angles to the retinal vessels and into the internal layers of the retina. They cannot be more than 200 microns ( $1/125$  inch) long. The thin muscular layer of the arteriolar wall gradually thins out, and the wall of the capillary is a single layer of endothelial cells of much greater length than width. Only one cell can pass at a time, often deformed by pressure. The capillaries do not necessarily undergo anatomic change in disease, although probably affected by pathologic chemical changes in the surrounding or contained fluids. They must be supposed to gape under pressure, and probably either undergo spasmodic contraction or become at times impervious by reason of arteriolar atony. In aged persons, the capillaries become impermeable with greater relative frequency than in younger subjects. These variations may be supposed to explain many cases of migraine or transient blindness in vascular hypertension.

As indicated by retinal sphygmometry, Bailliart states the range of minimal (diastolic) pressure in the normal subject as from 35 mm. of mercury in the papillary artery to 20 mm. in the papillary veins. Thus a drop of 15 mm. is necessary to keep constantly open the last arterioles and the capillary network, or in other words to overcome friction and the hydrostatic thrust of the vessel against the retinal tissue.

Modern medical education tends more and more to recognize the importance of imparting to the medical student a practical familiarity with ophthalmoscopy. A much more intimate experience in retinal diagnosis is essential to the internist and the neurologist. Above all others the ophthalmologist must be conversant with the pathologic anatomy and the prognostic significance of changes in the retinal vessels.

W. H. Crisp.

# ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

## CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy, embryology, and comparative ophthalmology

### 1

#### GENERAL METHODS OF DIAGNOSIS

Fink, W. H. An evaluation of visual-acuity symbols. *Amer. Jour. Ophth.*, 1945, v. 28, July, pp. 701-711; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42, p. 49 (6 figures, references.)

Koch, W. A new instrument for dark-adaptation tests. *Brit. Jour. Ophth.*, 1945, v. 29, May; pp. 234-243.

A simple, relatively inexpensive apparatus which is easy to construct is described. (2 photographs, 3 diagrams, references.) Edna M. Reynolds.

Lillie, W. I. Head and face pain. *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1944, 49th mtg., Sept.-Oct., pp. 15-17.

Pain and temperature sensations from the trigeminal area are received exclusively by the spinal tract and its nucleus. Probably both the main sensory and the spinal nuclei are concerned in tactile sensibility. The pain threshold in man is relatively uniform and stable, and is independent of age,

sex, emotional state, and fatigue. Lowered pain threshold is associated with hysteria and malingering, but is rarely, if ever, due to a structural disorder of the nervous system. The latter causes no change in the pain threshold, or raises it. The cornea perceives only pain and cold, while touch is absent. Pinching, sticking, or cutting the extraocular muscles does not cause pain, but traction on them produces immediate pain localized deep in the orbit. Pain from the iris is produced only by traction and is referred to the eyeball itself. If of sufficient intensity, it will spread over the ophthalmic division of the fifth nerve as does pain from increased intraocular pressure. In eyes with normal irises, abnormal amounts of light never produce true pain; but rather slight discomfort. All the tissues covering the cranium are more or less sensitive to pain, the arteries being especially so. The cranium, the parenchyma of the brain, most of the dura and pia-arachnoid, the ependymal lining of the ventricles, and the choroid plexus are not sensitive to pain. The intracranial structures, such as the

venous sinuses and their tributaries, parts of the dura at the base, the dural and the cerebral arteries at the base of the brain, the fifth, ninth, and tenth cranial nerves, and the upper three cervical nerves are pain sensitive.

Traction, displacement, distention, and inflammation of the cranial muscular structures are chiefly responsible for headaches. Increased intracranial pressure is neither a prime nor an essential factor in the production of headache. Brain-tumor headaches result from traction upon the larger arteries, veins, and venous sinuses, and upon certain cranial nerves, either by local traction adjacent to the tumor or by displacement from distant traction. Headaches associated with migraine and arteriolar hypertension are related to changes in the pulsation amplitude of the cranial arteries, chiefly branches of the external carotid. Headaches of ocular origin are usually produced by uncorrected hypermetropia and astigmatic and muscle imbalances. Any lesion which can produce traction, displacement, distention, or inflammation of any of the structures supplied by the ophthalmic division of the trigeminal nerve has the potentiality of producing pain, varying in degree from a slight uneasiness to extreme distress. (References.)

Charles A. Bahn.

Lloyd, R. I. Binocular and red-free ophthalmoscopy. *Amer. Jour. Ophth.*, 1945, v. 28, July, pp. 725-729; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42, p. 210. (3 figures, references.)

Lyle, D. J. Charts for recording lesions affecting the visual system. *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1945, 49th mtg., pp. 241-242.

The author reproduces two diagrammatic drawings showing horizontally

and laterally the structures of the visual system, each diagram accompanied by a visual-field chart for comparative record of the case.

Weiss, C., and Shevky, M. C. Clinical bacteriology and cytology of some ocular infection. *Amer. Jour. Clin. Path.*, 1944, v. 14, Nov., p. 567.

Bacteriologic and cytologic findings in 136 cases of acute and chronic eye infections are given. Included is a case of orbital infection due to *Torula histolytica* which is the second of its kind in the literature. The results of this type of examination are useful in determining the most effective therapy for conjunctivitis. By careful cultures preoperatively the incidence of intraocular infections following surgery can be lessened.

Robert N. Shaffer.

## 2

### THERAPEUTICS AND OPERATIONS

Chutko, M. B. Hexenal narcosis in ophthalmic surgery. *Viestnik Oft.*, 1942, v. 21, pt. 5, p. 39.

General anesthesia is often indicated in ophthalmic operations because of special behavior, lack of sensitiveness to local anesthetics, and the patient's psychology. The objections to inhalation narcosis are not valid for hexenal (U.S.S.R. brand of evipan sodium). Intravenous use of it at the front became necessary because of danger from local retrobulbar anesthesia in the presence of infections or because the need for careful removal of all traces of uvea in crushing injuries prolonged operations. Its first use was in the Finnish war. The wounded preferred it and insisted on it. In children it has been found to permit extraction of

cataracts where formerly only discissions were practicable.

M. Davidson.

Moreu, Angel. Modern anti-infectious treatment in ophthalmology. *Arch. de la Soc. Oft. Hisp.-Amer.*, 1944, v. 4, May-June, pp. 392-396.

Chemotherapy with albucid is indicated in two types of case, serpiginous ulcer and purulent iridocyclitis. In the former, atropine and dionine are used locally, and 10 c.c. of milk is given together with large doses of albucid. Twenty-four hours later 2 c.c. of blood is taken from the vein. The anterior chamber is evacuated by a small paracentesis and is refilled with the patient's blood, which by this time contains a high concentration of antibodies and sulfonamide. A contact glass is filled with the blood and applied to the eye. This treatment has proved efficacious in 12 cases. With good results, two cases of purulent iridocyclitis were treated in the same manner, except that the contact glass was not used.

J. Wesley McKinney.

Plastinin, N. V. Intramuscular hexenal narcosis in practice on children. *Viestnik Oft.*, 1942, v. 21, pt. 5, p. 32.

Hexenal (U.S.S.R. brand of evipan sodium) has been used intramuscularly in 90 children aged 4 months to 13 years, for a wide variety of operations. Its advantages are: no mask interfering with field of operation; narcosis long enough for eye operations; enables emergency operations to be done without preparation of patient and without anesthetist; may be administered in the ward and spares the child the psychic trauma inflicted by sight of preparations in operating room; quick and pleasant induction of sleep; lasting postoperative sleep; retrograde

amnesia; practically no contraindications; safety and ease of administration. The only difficulty so far encountered is the still incompletely worked out dosage.

A 10-percent solution is used, 5 to 6 c.c. is usually sufficient to initiate sleep in 3 to 5 minutes, and narcosis is usually complete in 10 to 15 minutes. If not, an additional 1 to 3 c.c. may be injected. The maximum dose required was found to be 13 c.c. and the maximum time for complete anesthesia 68 minutes. No vomiting during operation occurred, and after operation only when food was given too early. No salivation was observed, but some complaint of thirst afterward. One infant of two months had to be resuscitated from asphyxia, another held his breath long enough to require artificial respiration. Twitchings of muscles and spasms during operation indicate insufficient dosage. Instillation of a local anesthetic is desirable when conjunctival incision or fixation has to be used.

M. Davidson.

Swan, K. C. Use of methyl cellulose in ophthalmology. *Arch. of Ophth.*, 1945, v. 33, May, pp. 378-380.

There has been in ophthalmology the need for a nonirritating and chemically inert colloid which would dissolve in water to produce a viscous, colorless solution having a high degree of transparency and a refractive index similar to that of the cornea. Such a solution would be useful as a bland vehicle for ophthalmic medicaments, as a substitute for natural secretions in cases of keratoconjunctivitis sicca, and as an emollient and cohesive solution to be used with contact lenses and gonioscopic prisms. Attempts have been made to adapt various compounds for these purposes, but with only partial

success. Most widely used have been acacia, tragacanth, and gelatin, but they are chemically unstable, have high refractive indexes, and are good mediums for the growth of bacteria and fungi. A synthetic substance, methyl cellulose, has considerable advantages over these naturally occurring gums. Its properties and some of its ophthalmic uses are reported. Directions for its use in each of these categories are given. (References.)

R. W. Danielson.

### 3

#### PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Burian, H. M., and Ogle, K. N. Meridional aniseikonia at oblique axes. *Arch. of Ophth.*, 1945, v. 33, April, pp. 293-310; also *Trans. Sec. on Ophth. Amer. Med. Assoc.*, 1944, 94th mtg., p. 189.

The discomfort experienced by patients who require an astigmatic correction at oblique axes may be at least partially explained as due to induction, by the correcting lenses, of a meridional aniseikonia at an oblique axis. An aniseikonic correction at an oblique axis can be determined if, in addition to the usual measurements for image-size differences between the vertical and horizontal meridians, a measurement of the declination error introduced by the aniseikonic error at the oblique axis is also obtained.

Seventy-six patients were given prescriptions for aniseikonia at oblique axes on the basis of measurements on the space eikonometer. The data on 13 patients had to be discarded because of lack of information or because of unusual complicating factors. Of the remaining 63 patients, 36 were relieved of their symptoms, 16 were partially relieved, and 11 derived no benefit. A

detailed tabulation of the data obtained is given, along with a more complete résumé of some cases. (3 figures, bibliography.) John C. Long.

Lujinsky, G. F. Correcting glasses in the breathing mask. *Viestnik Oft.*, 1942, v. 21, pt. 5, p. 43.

Several means of mechanically attaching temporary or permanent correcting lenses to gas-masks are described and illustrated.

M. Davidson.

Pokrovsky, A. A. The question of visual correction in the breathing mask. *Viestnik Oft.*, 1942, v. 21, pt. 5, p. 46.

Two methods for mechanically attaching correcting glasses to gasmasks, utilizing flexible rubber frames, are described. (Illustrated.)

M. Davidson.

### 4

#### OCULAR MOVEMENTS

Adler, F. H. Pathologic physiology of convergent strabismus. *Arch. of Ophth.*, 1945, v. 33, May, pp. 362-377.

This paper, delivered before the Chicago Ophthalmological Society on January 15, 1945, is the first Sanford Gifford Memorial Lecture. It consists of technical basic physiology which is difficult to abstract, but which should be read in full by anyone interested in the etiology of the nonaccommodational type of strabismus.

The author discusses proprioception from the ocular muscles, cortical centers for convergence, subcortical centers and pathways for convergence and divergence, and the vestibular apparatus. The literature and the author's own experiments are quoted to show the marked tendency toward, or in-

crease in, esophoria in anoxia and acute alcoholism.

In all cases of convergent squint, except those in which the condition is due to paralysis of an ocular muscle, and regardless of the degree of perfection of fusion, the important factor in the causation of squint is the force which produces it, and that is an excessive convergence innervation. (14 drawings, references.)

R. W. Danielson.

Berens, C., and Fonda, G. Ocular sequelae of administration of general anesthesia. *Arch. of Ophth.*, 1945, v. 33, May, pp. 385-388.

A search of the literature revealed only one report of paralysis of the extraocular muscles associated with general anesthesia other than spinal anesthesia. There have been approximately 175 cases of paresis of the extraocular muscles related to the use of spinal anesthesia and one case in which such paresis was associated with local anesthesia administered for tonsillectomy.

In the case now described, paralysis of the right superior rectus muscle, pseudoptosis of the right upper eyelid, exophthalmos of the right eyeball, and fibrosis of the right inferior rectus muscle were diagnosed after administration of ethylene-ether anesthesia for an operation for pilonidal cyst.

The surgical technique by which these ocular abnormalities were handled is described. The most probable explanation of the mechanism by which the operation for pilonidal cyst with the patient under general anesthesia caused paralysis of the right superior rectus muscle, exophthalmos, and complete fibrosis of the inferior rectus muscle was that an embolism of the artery supplying the superior

rectus muscle occurred. Fibrosis of the internal rectus muscle may have been caused by secondary contracture associated with embolic myositis. A specimen of the inferior rectus muscle was not obtained for biopsy because of extensive depression and fibrosis. Before operation it was thought that numerous adhesions existed between the muscle and the eyeball as the result of inflammation, but none was found.

The severe vertical strabismus was remedied by complete tenotomy of the inferior rectus muscle, resection of 8 mm. of the superior rectus muscle, transplantation of the lower half of the lateral rectus muscle to the temporal half of the stump of the inferior rectus muscle, and reattachment of the upper half of that stump. A useful field of binocular fixation resulted, indicating that the technique employed was reasonably sound physiologically. (4 figures, references.)

R. W. Danielson.

Dare, L. P. Heredity as a factor in squint. *Amer. Jour. Ophth.*, 1945, v. 28, Aug., pp. 898-899.

Hardy, L. H., Chace, R. R., and Wheeler, M. C. Ophthalmic prisms. *Arch. of Ophth.*, 1945, v. 33, May, pp. 381-384.

The work of Jackson, Prentice, and others in standardization of prisms is reviewed. Four methods of numbering prisms are available: the dimensions of the apex angle ( $\alpha$ ), expressed in degrees ( $^\circ$ ), the actual deviation, in degrees, produced by the prism when it is set at its position of minimal deviation, the centrad and the prism diopter.

In 1890 prisms were not commonly used to measure strabismus. Most

squints were estimated by the Hirschberg method, or the deviation was measured on the perimeter. The latter method is still the choice of most European and of many American ophthalmologists. Not until twenty years later, largely under the influence of Duane, was the prism-and-cover test popularized. This method is now widely taught and used, particularly in America.

No set of standards has been universally employed, and few, if any, manufacturers indicate in their markings the unit used. As a result prisms bearing the same label vary widely in their powers of refraction, and the owner of a set may be misled in interpreting results of his measurements.

In 1931 Hardy conducted measurements on eleven sets of prisms belonging to himself, his friends, and various ophthalmic clinics. The results showed wide variations. Last year further elaborations for measurements were set up and the data extended to include twenty sets of prisms, two of which were sets of plastic prisms. Measurements on these twenty sets is reported in detail and show that many of them have errors exceeding those of reasonable manufacturing standards. (2 figures, references.)

R. W. Danielson.

Wells, Louisa. Orthoptic fictions and misconceptions. *Amer. Jour. Ophth.*, 1945, v. 28, Aug., pp. 890-895. (References.)

## 5

### CONJUNCTIVA

Weber, F. P. Sjögren's syndrome, especially its nonocular features. *Brit. Jour. Ophth.*, 1945, v. 29, June, pp. 299-312.

Chronic inflammatory changes in the

parotid glands with recurrent exacerbations and similar changes in the other salivary glands and the lacrimal glands constitute Sjögren's syndrome. In its complete form it includes keratoconjunctivitis sicca, xerostomia, rhinitis sicca, pharyngitis sicca, and laryngitis sicca; but it occurs far more often in an incomplete form. Females are much more predisposed than males.

The literature is reviewed and ten cases are reported, all occurring in women, and mostly in the age groups beyond 40 years. Alopecia, keratitis, and reduced vision were associated with the parotid and salivary-gland changes and various other disturbances.

The author concludes that the manifold changes encountered can only be explained by some derangement of the vegetative nervous system, perhaps connected with structural or functional changes in the female sexual system. (References.) Edna M. Reynolds.

## 6

### CORNEA AND SCLERA

Duncan, H. A. G. Plastic corneal bath for application of penicillin. *Arch. of Ophth.*, 1945, v. 33, April, pp. 313-314.

A simple corneal bath of plastic (acrylic-acid derivative) has been modeled from an average-sized contact lens. The corneal curvature is made greater than that of an ordinary contact lens. A plastic tube is molded in place between the apex and the scleral gutter at an angle of 20 degrees with the anteroposterior axis. The tube is clamped to a device attached to the nose and forehead by adhesive. If a constant bath is desired a drip can be arranged from an ordinary set for continuous intravenous infusion. A



solution containing 1,000 units of penicillin per c.c. is used for this bath as well as for instillation. (2 illustrations, 1 reference.)

John C. Long.

Hilding, A. C. Comparative flaccidness and resilience of cornea and sclera. *Amer. Jour. Ophth.*, 1945, v. 28, Aug., pp. 900-902. (4 illustrations.)

Juler, F., and Young, M. Y. The treatment of septic ulcer of the cornea by local applications of penicillin. *Brit. Jour. Ophth.*, 1945, v. 29, June, pp. 312-322.

Twenty-three cases of septic ulcer of the cornea treated with local applications of penicillin solution, 500 units to the c.c., are reported. The routine treatment consisted of hourly instillations of penicillin during the day and two-hourly instillations at night until the condition was under control. Atropine sulphate was used three or four times daily and the eyes were covered.

In a number of cases, with or without the previous application of decicaine, a few crystals of penicillin salt were applied to the surface of the ulcer. This caused no undue reaction of the tissues of the cornea or conjunctiva, but in some cases the subsequent pain was so severe as to necessitate morphine or a retrobulbar injection of 4 percent procaine. Impurity of the drug is suggested as the cause of the pain. Later, the practice of curetting beneath the overhanging edge of the ulcer before using the crystalline penicillin salt was adapted. Excellent results were obtained by these methods in 14 cases, good results in 5 cases, poor in 2 cases, and bad in 2 cases. Improvement was dramatic in a few cases of the less advanced type. Conjunctival discharge usually disappeared within 24 to 48

hours. Cases with secondary glaucoma showed more delay in healing than uncomplicated cases. In five of these cases, a Saemisch section was necessary to secure healing. The authors recommend that the Saemisch section be not delayed in cases in which improvement in unsatisfactory.

A note on the compatibility of penicillin with drugs used in ophthalmology is added. As tested in vitro, solutions of the following drugs do not interfere with the potency of penicillin: atropine sulphate, cocaine hydrochloride, homatropine hydrobromide, procaine, and decicaine. Fluorescein in higher concentrations inhibits penicillin to a small extent. Penicillin mixed with vaseline or adeps lanae retains its activity for 10 to 12 weeks in the refrigerator. At room temperature the vaseline ointment was active for seven weeks but the lanoline ointment was inactive. With a completely anhydrous base, penicillin fails to diffuse in vitro, but satisfactory results may be obtained by adding to the base 10 to 20 percent water. (3 figures, 1 table, references.)

Edna M. Reynolds.

Maumenee, A. E., Hayes, G. S., and Hartman, T. L. Isolation and identification of the causative agent in epidemic keratoconjunctivitis (superficial punctate keratitis) and herpetic keratoconjunctivitis. *Amer. Jour. Ophth.*, 1945, v. 28, Aug., pp. 823-839. (2 drawings, 4 charts, 2 photomicrographs, bibliography.)

Miller, R. B. Corneal anesthesia in hysteria. *United States Naval Med. Bull.*, 1945, v. 44, April, pp. 749-751. (See Section 12, Visual tracts and centers.)

## 7

# UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Boshoff, P. H., and Theron, J. J. *Heterochromia sympathica*. Arch. of Ophth., 1945, v. 33, April, pp. 311-312.

Four cases of heterochromia sympathica were observed in a series of 13,450 patients in South Africa. Two of the patients gave a history and presented scars of severe birth injuries. Both of these patients, in addition to showing differences in the color of the irises, had inequality in pupil size and in the width of the palpebral fissure. In one patient, the skin of the left side of the forehead and of the eyelids was continually wet with perspiration. The third patient showed abnormal flushing of the left side of the face. The left cornea was 0.5 mm. larger than that of the right eye, and the left pupil was larger. The iris of the left eye was brown, and that of the right eye was blue. In the fourth case, over a 14-year period, the color of the eyes had apparently changed from light gray to brown, and at the time of examination the right eye was blue and the left eye brown. The first three cases, at least, presented symptoms suggestive of a lesion of the sympathetic nervous system. (References.) John C. Long.

Fridman, S. J. The pathogenesis of sympathetic ophthalmia. Viestnik Oft., 1942, v. 21, pt. 5, p. 52.

Observation of serious cases of uveitis, accompanied by optic neuritis, vitreous opacification, and choroidal exudates—at times typically metastatic, following meningitis, at others with considerable papilledema, all responding well to repeated lumbar puncture, and all revealing a patho-

logic spinal fluid to begin with—suggested to the writer a new approach to the problem of the pathogenesis of sympathetic ophthalmia. There appeared in the literature occasional reports of meningitis complicating sympathetic ophthalmia, and in 1941 Tikhomirov (Viestnik Oftalmologii, v. 19, pts. 7-8) reported a rare case of neuroretinitis due to opticochiasmatic arachnoiditis and accompanied by sympathetic uveitis responding well to repeated lumbar punctures. Three cases of sympathetic ophthalmia were therefore studied and treated from this standpoint. One case had already had one eye enucleated and the other was atrophic, but the patient complained of severe headaches. Neurologic examination, including the spinal fluid, revealed a definite basal meningitic process which responded to appropriate treatment. The second case did not consent to lumbar puncture but clinically there was otherwise evidence of a disturbance of the central nervous system. After enucleation of the injured eye the sympathizing eye recovered. After enucleation of the offending eye, the third case again showed a frankly pathologic spinal fluid. When ophthalmoscopy became possible, there were indications of preceding optic-nerve involvement in the sympathizing eye as well as disseminated choroidal lesions. Treatment directed to the neurologic condition resulted in recovery of the eye. The three observations point toward the presence of a serous meningitis accompanying sympathetic ophthalmia, most likely around the chiasmal cistern, and permitting transmission of the process from one eye to the other. Lumbar puncture is therefore regarded as indicated in all eye injuries where

possibility of sympathetic ophthalmia exists, in order to favor as early a diagnosis as possible. Repeated lumbar puncture is also of therapeutic value.

M. Davidson.

Goldberg, H. D. Gonorrheal choroiditis treated with penicillin. *Arch. of Ophth.*, 1945, v. 33, May, p. 406.

Although there have been numerous reports as to the efficacy of penicillin in treatment of external ocular conditions, none has indicated that inflammations of the posterior uveal tract are helped.

The author outlines in detail a case of choroiditis in which the result was particularly gratifying. Penicillin had been used in five other cases of choroiditis, in which the cause was probably tuberculous. There was no improvement in these cases, but in the one case, in which the etiologic agent seemed to be the gonococcus, the result was spectacular. This response can well be correlated with the specific reaction of other forms of gonococcal infection to penicillin. Penicillin should not be used in the treatment of choroiditis unless the lesion is presumed to be due to gonorrhea.

R. W. Danielson.

Irvine, S. R., Maury, F., Shultz, J., Thygeson, P., and Unsworth, A. The treatment of nonspecific uveitis with penicillin. *Amer. Jour. Ophth.*, 1945, v. 28, Aug., pp. 852-855. (2 tables, references.)

Loewenstein, A., and Foster, J. Iridoschisis with multiple rupture of stromal threads. *Brit. Jour. Ophth.*, 1945, v. 29, June, pp. 277-282.

The author suggests the name of "iridoschisis" for a clinical condition in which there is division of the iris

stroma into two layers, the anterior of which floats in the aqueous. Some of the anterior stromal fibers rupture and their distal ends float freely in the anterior chamber. Eight cases previously reported in the literature are reviewed and an additional case is reported.

The authors' patient, a woman aged 75 years, had had bilateral iritis in 1924 followed by bilateral iridectomy for glaucoma in 1928. It was not possible to determine whether or not the so-called iritis was an early glaucoma. When examined in 1940, because of failing vision and recurrent ocular pain, a curious change in the lower part of the iris of each eye was seen, resembling plants floating in a pool. The patient was not seen again until 1944, when she developed intense pain and complete blindness in the left eye, due to absolute glaucoma.

Histologic examination of the left eye showed general atrophy of the iris with the anterior layer preserved on either side of the iris coloboma above, but represented elsewhere by thin, floating membranes resembling fine lace. Physiologic fatty changes of senile origin were found in the periphery of the cornea, the sclera, the ciliary body, and Bruch's membrane. The atrophic iris tissue was free from fat. Several free threads, completely separated from other iris tissue, were seen in the sections. Each of these contained a blood vessel with well-preserved, thick, glassy endothelium, whose lumen was filled with red blood corpuscles. The dilator was well preserved and at one point hypertrophied. The sphincter fibers were normal. The posterior part of the eye revealed no pathologic changes.

It is suggested that the mechanism of these changes is exaggeration of a

physiologic aging process of the iris, in which the middle layers became atrophic. Subsequently, the anterior and posterior layers of the iris are separated and finally the threads of the anterior layer which remain, and which contain a blood vessel, rupture and float freely at one end. The basic change is senile but the process may be aggravated by proteolytic enzymes in the aqueous, the product of glaucomatous metabolism. (7 illustrations, references.) Edna M. Reynolds.

Loewenstein, A., and Garrow, A. Thrombosis of the retinal, choroidal, and optic-nerve vessels. *Amer. Jour. Ophth.*, 1945, v. 28, Aug., pp. 840-851. (15 photomicrographs, references.)

Rosen, Emanuel. Uveitis, with poliosis, vitiligo, alopecia, and dysacusia (Vogt-Koyanagi syndrome). *Arch. of Ophth.*, 1945, v. 33, April, pp. 281-292.

A case of Vogt-Koyanagi syndrome in a 24-year-old Puerto Rican is reported in very considerable detail. The first of four attacks of uveitis occurred five years before the present observations. Among the distinctive ocular characteristics observed in this case were: (1) depigmentation of the fundus, producing a red reflex seen from almost any angle when a beam of light struck the eye; (2) keratic precipitates, for the most part in the mid-corneal zone, closely crowded together; (3) small, fluffy "Koeppe nodules"; (4) atrophy of the inner circle of the iris, present in each eye; (5) white oval atropic patches in the periphery of the retina of each eye; (6) deep anterior chambers (reported previously by several authors); (7) the nerve head elongated ovally, and, because of several areas of depigmenta-

tion just adjacent to it, producing an almost oblong effect; (8) the macula presenting a peculiar heaped-up arrangement of pigment; (9) decomposition of the vitreous framework, with the presence of minute brownish granules.

There were some patches of white hair on the occiput and some small white eyelashes in each lid. Vitiligo was seen on the shoulders and chest. Treatment consisted in desensitization to horse serum. The patient's condition gradually improved so that vision of 20/20 was obtained in one eye and 20/25 in the other.

The author tabulates 47 cases of this syndrome previously noted in the literature. Horse serum is suggested as a form of therapy. The relationship between this syndrome and other diseases is pointed out, and an explanation of the nature of the syndrome is suggested. (3 illustrations, 2 tables, references.) John C. Long.

Sampson, R. Periarthritis nodosa affecting the eye. *Brit. Jour. Ophth.*, 1945, v. 29, June, pp. 282-288. (See Section 10, Retina and vitreous.)

Spaeth, E. B. Iridocyclitis (uveitis), complicating cataract and retinal separation: their interrelationship. *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1945, 49th mtg., May-June, pp. 265-274.

Thirty-five consecutive cases of this complex are surveyed, being considered as parts of an inflammatory or degenerative syndrome. Class 1 includes 17 cases of uveitis, cataract, and retinal separation and subsequent cataract; class 2, 7 cases of the sequence of retinal separation and then uveitis, or the two occurring simultaneously with complicating cataract; class 3, 11 cases of complicated cataract

occurring first, presupposing pre-existence of a uveitis, or occurring with reactivation of an old uveitis post-operatively, and terminating with retinal separation.

Retinal separation is basically not caused by myopia but by a primary choroiditis and retinal atrophy. Retinal detachment and probably obliteration of peripheral vessels occur during the uveitis. The causative factors found were: (1) a bacterial endogenous infection, especially from teeth, tonsils, and prostate; (2) tuberculous infection. Preoperative hospitalization for approximately two weeks is advised so that foci of infection and other etiologic factors may be reduced to a minimum, and also so that retinal tears may be given the best chance to return as near the choroid as possible.

An appeal is made for early and accurate diagnosis of uveitis, with prompt reduction or elimination of causative factors. Treatment with foreign protein is preferred. (2 illustrations, references.) Charles A. Bahn.

## 8

### GLAUCOMA AND OCULAR TENSION

Boshoff, P. H. Use of Troncoso's magnesium implant in cyclodialysis for relief of glaucoma. *Arch. of Ophth.*, 1945, v. 33, May, pp. 404-405.

Implantation of a strip of magnesium along the spatula tract in cyclodialysis is a modification suggested by Uribe Troncoso (*Amer. Jour. Ophth.*, 1940, v. 23, p. 835). The author reports two cases in which moderately severe reactions took place. In both cases the exact technique as described by Troncoso was followed, except that a single 6 by 1.5 mm., strip of magnesium was employed. The author is of the opinion that a single strip of magnesium meas-

uring 5 to 6 by 1 mm. is the maximum size to be used, because of the tendency to excessive formation of gas. If this does occur, the gas may be allowed to escape by inserting a thin hollow needle through the cornea. (2 figures, references.) R. W. Danielson.

Grossman, E. E. Glaucoma associated with nevus flammeus. *Arch. of Ophth.*, 1945, v. 33, May, pp. 389-391.

The occurrence of glaucoma with nevus flammeus is rather rare in both the foreign and the American literature. In the present case, although deep glaucomatous cupping was present, no evidence of increased intraocular pressure was noted. The number of cases on record in which there was no evidence of increased intraocular pressure, or of instability of the pressure-regulating mechanism, but in which there was excavation of the disc of a glaucomatous character, is sufficient to warrant the assumption that the cupping is not always due to glaucoma; but the condition should be called pseudoglaucoma.

Although there was no typical increase in intraocular pressure in the present case, the author suggests that glaucomatous cupping may have resulted from a congenitally weakened lamina cribrosa, on which a tension of 19 or 23 mm. of mercury produced as pathologic an effect as would a tension of 40 or 50 mm. of mercury in the usual eye. (References.)

R. W. Danielson.

Guyton, J. S. Choice of operation for primary glaucoma with cataract. *Arch. of Ophth.*, 1945, v. 33, April, pp. 265-268. (See *Amer. Jour. Ophth.*, 1945, v. 28, Sept., p. 1046.)

Hess, Leo. Pathogenesis of glau-

coma. *Arch. of Ophth.*, 1945, v. 33, May, pp. 392-396.

The author reviews his own previous publications. He argues that glaucoma does not arise primarily in the eyeball, but has its origin in certain nerve structures outside the eye. He considers the actual site of the crisis in acute glaucoma to be the ciliary ganglion and the nerves and capillaries of the ciliary body. According to his concept, the eyeball, certain peripheral nerves, the ciliary ganglion, and the diencephalic center form a unit concerned with the vital function of regulation of intraocular pressure, and finally governed, as are the functions of all the visceral organs, by the cortex. (References.) R. W. Danielson.

Meyer, S. J., and Sternberg, P. Surgical management of glaucoma in correlation with gonioscopy and biomicroscopy. *Arch. of Ophth.*, 1945, v. 33, May, pp. 358-361. (See *Amer. Jour. Ophth.*, 1945, v. 28, July, p. 786.)

## 9

### CRYSTALLINE LENS

Guyton, J. S. Choice of operation for primary glaucoma with cataract. *Arch. of Ophth.*, 1945, v. 33, April, pp. 265-268. (See *Amer. Jour. Ophth.*, 1945, v. 28, Sept., p. 1046.)

Hilding, A. C. Experimental and clinical studies on certain safety factors in closure of cataract incisions. *Amer. Jour. Ophth.*, 1945, v. 28, Aug., pp. 871-885. (14 figures, 1 table, references.)

Lutman, F. C., and Neel, J. V. Inherited cataract in the B. genealogy. *Arch. of Ophth.*, 1945, v. 33, May, pp. 341-357.

The numerous publications on de-

velopmental cataract have tended to show uniformity in the type of cataract observed within any family line. Nevertheless, it is sometimes found that certain cataractous persons in a given pedigree have a type of opacity of the lens significantly different from that presented by the remaining affected members of the family. This fact has been commented on by various observers, and from time to time a question has been raised as to the etilogic relationships of the various types. The present paper describes a genealogy of 123 people, 44 with cataract, which genealogy is remarkable for the variety of forms the cataract assumes. The genealogy extends over five generations. Thirty-four of these 123 persons were examined by the authors, and 21 of these had cataract.

The persons composing the genealogy are the descendants of one William B., who at the age of 24 years migrated from England to New York. The majority of the family have remained in rural districts and have been laborers, farmers, and unskilled workmen. No one in the family either with or without cataract has achieved unusual prominence or success in any field of work; nor were any persons encountered of the economically dependent and shiftless type. Evidences of physical, moral, or mental degeneracy in the family were absent.

Most of those with cataract whom the authors saw had had only one eye treated surgically, and with this eye possessed approximately normal corrected vision. In a majority of the cases the surgical treatment up to about the age of 30 years had been repeated dissections. The cataract was unaccompanied by any other structural abnormalities of the eye.

Three distinct types of cataract can

be recognized among the affected persons, as follows: (a) fenestrated opaque flakes, predominantly in the axial region of the anterior adult nucleus, (b) a fetal nuclear opacity containing either flakes or spherical bodies, and (c) opaque lens fibers, most prominent adjacent to the adult lens sutures. The third type was seen in only a single person.

Three hypotheses for the occurrence of distinct types of cataract within a single pedigree are advanced, namely: (a) the existence of genetic and environmental modifiers which bring about variations in the expression of a "main" factor, (b) the simultaneous presence in the founder of the line of two different, independently inherited factors responsible for cataract, and (c) the occurrence of mutation. The first theory is favored. (13 figures, references.) R. W. Danielson.

## 10

## RETINA AND VITREOUS

Dimitry, T. J., and Lombardo, R. T. The lipotropic effect of choline in retinal tuberculosis. *Amer. Jour. Ophth.*, 1945, v. 28, Aug., pp. 902-903. (References.)

Kaminskaya, Z. Diagnostic importance of certain alteration of the ocular fundus with subarachnoid hemorrhages. *Viestnik Oft.*, 1942, v. 21, pt. 5, p. 13.

In the early stages the diagnosis of subarachnoid hemorrhage is readily made on the basis of sudden onset, meningitis syndrome, and bloody spinal fluid. Later, when only headaches remain, the fundus picture may help in making a retrospective diagnosis. Fundus sequelae have been observed in four cases of head contusion

with loss of consciousness and transient loss of vision in one eye. The fundus lesions were all similar and consisted in prepapillary and parapapillary connective-tissue membranes, suggestive of retinitis proliferans lesions but differing in that no other fundus pathology was found and the source of hemorrhage was therefore presumed to be extraocular, the result of seepage of subarachnoid blood into the vitreous via the cribriform plate. (Illustrated.) M. Davidson.

Loewenstein, A., and Garrow, A. Thrombosis of the retinal, choroidal, and optic-nerve vessels. *Amer. Jour. Ophth.*, 1945, v. 28, Aug., pp. 840-851. (15 photomicrographs, references.)

Pollak, H. Observations on the effect of riboflavin on the oral lesion and dysphagia, and of riboflavin and brewer's yeast on dark adaptation, in a case of so-called Plummer-Vinson syndrome. *Brit. Jour. Ophth.*, 1945, v. 29, June, pp. 288-299.

Seventeen years earlier the patient, a male aged 39 years, had had gastroenterostomy for duodenal ulcer. For four years prior to hospital admission, he had had soreness of the tongue, cracks at the corners of the mouth, difficulty in swallowing, and such soreness of the mouth that he could hardly eat. The tongue was smooth and magenta-colored, the red-cell count 3.94 million, Hb. 38 percent. Gastric secretion showed no free HCl after histamine, and gastroscopy showed marked atrophy of the mucosa. Under daily injections of 5 mg. of riboflavin for five days, and further treatment with fersolate, brewer's yeast, and ascorbic acid, the various conditions improved.

When seen again six months later,

the patient was well except for recurrence of the soreness at the corners of the mouth and slight dysphagia. He complained at this time of burning sensations in the eyes and poor vision in the dark. Visual acuity, fundi, and fields were all normal. Slitlamp examination revealed a considerable increase in the vascularization of the limbus. Dark adaptation was found to be markedly impaired.

Serial tests of dark adaptation were made over a period of eight months. When the performance had remained stationary for two months without treatment, a slight but significant improvement was recorded during treatment with riboflavin. After his adaptation had been allowed to fall back to the original level, the patient was treated with 20 gm. of brewer's yeast daily for four months. During this period, dark adaptation gradually returned to normal.

Impairment in dark adaptation apparently reflects a disturbance in general metabolism, reversible by dietary factors of the vitamin-B complex. (3 graphs, references.)

Edna M. Reynolds.

Sampson, R. *Periarteritis nodosa affecting the eye.* Brit. Jour. Opth., 1945, v. 29, pp. 282-288.

A case of periarteritis nodosa is described in which the choroidal, retinal, and ciliary arteries were affected. Ophthalmic examination was made several times during the four weeks preceding the patient's death. There was a concomitant divergent strabismus of 15 degrees and convergence was absent. In the right eye, the retinal vessels were of normal caliber, but there was generalized retinal edema and the disc margins were blurred. There were several small areas

of retinal detachment, and deep to the retina in these areas were grayish-white nodules of oval or branching shape, resembling miliary tubercles of the choroid. The left eye showed a large, globular retinal detachment far out on the temporal side. It had all the appearances of an exudative detachment and there was no hole or tear. The areas of detachment in the right eye later became confluent and several new patches of choroidal exudate appeared in both eyes. A week after the first examination the right detachment had diminished and the left detachment had disappeared.

A week before death, the fundi were normal except that there were small lightly pigmented scars at the sites of the choroidal lesions previously noted. No sign of albuminuric retinopathy appeared.

The eyes and the orbital contents were obtained for examination. No definite pathologic changes were found in the orbital structures. The anterior halves of the globes showed irregular elevations of the retina produced by subretinal exudate as far forward as the ora serrata. In the upper temporal quadrant of the left eye a melanoma of the choroid was discovered, of low-grade malignancy.

Microscopic examination showed destruction of the neuroepithelium, probably due to post-mortem changes. In the nerve fiber and ganglion-cell layers, there were many vacuoles. There was definite papilledema of the right disc. Some of the retinal vessels showed thickening of their walls. The optic-nerve sheath of the right eye was distended and there was a hemorrhage in front of the lamina cribrosa. A thrombus was seen in the central vein. Many of the choroidal vessels had thickened walls and some of them had



a hyaline character. One cicatricial nodule occupied the whole thickness of the choroid, apparently because of thrombosis of one of the large vessels.

The main interest of the case lies in the finding of healed arteritis in many of the choroidal vessels. Similar appearances were found in the retinal vessels of the right disc and in some of the extrascleral vessels. (5 illustrations, references.)

Edna M. Reynolds.

Spaeth, E. B. Iridocyclitis (uveitis), complicating cataract and retinal separation: their interrelationship. *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1945, 49th mtg., May-June, pp. 265-274. (See Section 7, Uveal tract, sympathetic disease, and aqueous humor.)

## 11

### OPTIC NERVE AND TOXIC AMBLYOPIAS

Loewenstein, A., and Garrow, A. Thrombosis of the retinal, choroidal, and optic-nerve vessels. *Amer. Jour. Ophth.*, 1945, v. 28, Aug., pp. 840-851. (15 photomicrographs, references.)

Popov, M. Z. The mechanism of secondary deformity of the optic nerve in war injuries of the orbit. *Viestnik Oft.*, 1942, v. 21, pt. 5, p. 3.

Isolated injuries of the orbit and optic nerve are very uncommon in this war. Of the 13 cases observed, resulting from injury to the outer orbital wall or the zygomatic arch, 11 cases resulted in injury to the optic nerve of the same side, and two cases presented a picture of injury of the optic chiasm. In five cases there was optic atrophy. The earliest observation of atrophy was 14 days after the injury. Eight eyes presented hyperemia of the nervehead. In two opticochiasmatic cases

the right eyes suffered contusions, while the left eyes presented lesions of the nervehead. X-ray studies done on only four cases showed fissures of the optic foramina in three and a foreign body in the orbit in the fourth case. The hyperemia is explained as a reactive hyperemia in the presence of injury to the orbital wall and the atrophy as the result of pressure on the nerve fibers from the exudation accompanying the hyperemia.

M. Davidson.

## 12

### VISUAL TRACTS AND CENTERS

Givner, Isadore. Ophthalmologic features of intracranial chordoma and allied tumors of the clivus. *Arch. of Ophth.*, 1945, v. 33, May, pp. 397-403.

Intracranial chordoma and allied tumors of the clivus are of significance to the ophthalmologist, who may be the first to see the patient, since diplopia and visual disturbances occur in over a third of the cases and may, together with headache, be the only symptoms.

A chordoma is a neoplasm arising from embryonic rests of the chorda dorsalis, a specific embryonal tissue about which the spinal column develops. As the base of the skull is molded, the posterior end of the cranial part of the chorda is forced backward and dorsally so that it lies on the occipital plate in the dorsal groove anterior to the foramen magnum. This embryonal tissue persists in infants in the centers of the intervertebral discs and in the coccyx, as well as at the base of the skull.

In this paper attention is directed only to sphenoccipital tumors. Less than one hundred cases of such chordoma have been reported. The benign

form is of no clinical importance. The so-called malignant form is a slow, expansile growth, traversed by fibrous septums, between which is a sparsely cellular tissue composed largely of an intracellular matrix of gelatinous or mucinous character. The early structure resembles hyaline cartilage but is without intercellular substance. The cells are round, large, vacuolated, and hyperchromatic, and may resemble epithelium. The majority of the tumors first cause symptoms in the third or fourth decade of life—the average age being 36 years.

The four most common symptoms of tumors of the clivus are headache, visual disturbance, nasal obstruction (from ventral extension of the tumor in the direction of the nasopharynx) and nuchal pain. The headaches are of increasing severity, with temporary periods of relief, and are referred to the frontal or the occipital region. Visual disturbances are the result of compression of the optic chiasm or of the sixth nerve.

In the differential diagnosis the following possibilities should be considered: tumor of the fourth ventricle, meningioma of the cerebellopontile angle, infiltration tumor of the pons (glioma), and vascular lesions of the pons. Two cases are reported. (6 figures, references.) R. W. Danielson.

Miller, R. B. Corneal anesthesia in hysteria. *United States Naval Med. Bull.*, 1945, v. 44, April, pp. 749-751.

Among 600 men examined in an induction station 19 were found to be affected by hysteria, including 17 literate and illiterate inductees who showed bilateral corneal anesthesia. Corneal anesthesia was found, however, in a man otherwise showing no nervous symptoms, and in a group of

men whose general conditions had been diagnosed as due to hysteria but not recorded as showing corneal anesthesia. The author concludes that bilateral corneal anesthesia must be considered an important and virtually pathognomonic sign of the psychoneurosis. M. Lombardo.

## 13

## EYEBALL AND ORBIT

Krol, A. G. Is it necessary for the oculist to do urgent enucleation at the fighting front? *Viestnik Oft.*, 1942, v. 21, pt. 5, p. 27.

Postponement of enucleation for crushing injuries of the globe, waiting 7 to 12 days, is recommended in the presence of ecchymosis of lids and conjunctivas. M. Davidson.

Medviedev, N. I. The technique of formation of mobile stump after enucleation. *Viestnik Oft.*, 1942, v. 21, pt. 5, p. 13.

Best possible cosmetic result after enucleation is particularly important in view of the youth of the war injured. The author implants the scleral capsule of the enucleated eye. At first the whole capsule was used, but it was found to give rise to severe postoperative edema. A considerable portion of the attached optic nerve was also used at first, but it was abandoned for the same reason. Now the author sections the globe at the equator, and removes the nerve entirely to leave an open scleral canal. Four incisions are made in the sides of the sclera, 4 mm. from the nerve, for the reception of the internal and inferior recti, 5 mm. from it for the superior rectus, and 6 mm. from it for the external rectus. Thus prepared the sclera is placed on a finger tip, inserted, and turned so that the

nerve canal faces forward. The four tendons are carefully spread out, and the ends sutured to the central lips of the incisions. The conjunctiva is sutured on top loosely, so as to leave the nerve canal open for drainage. The results are a compact mobile stump and a cosmetically excellent prothesis. Homotransplants and scleras from cadaver eyes may also be employed. (Illustrated.)

M. Davidson.

## 14

### EYELIDS AND LACRIMAL APPARATUS

Berke, R. N. Resection of the levator palpebrae muscle for ptosis. *Arch. of Ophth.*, 1945, v. 33, April, pp. 269-280; also *Trans. Amer. Ophth. Soc.*, 1944, v. 42, p. 411.

Resection of the levator muscle is the operation of choice for correction of ptosis when the muscle is not completely paralyzed. The author has made elaborate studies on cadaver material to demonstrate the anatomy and the effects of resection of the muscle. Special attention has been devoted to the Bowman-Wheeler operation and the Blaskovics technique. Apparently Mueller's muscle and the tendon of the levator muscle are always excised together in routine resection of the levator muscle as reached through conjunctiva. When resection of the levator muscle fails to correct the ptosis adequately, the fault may be due to resection of Mueller's muscle instead of the tendon of the levator muscle. Inadequate correction after resection of the levator muscle may be due to insufficient resection, pulling out of the suture, or absence of the levator muscle. (6 photographs from cadaver specimens, references.)

John C. Long.

Hague, E. B. Surgical reconstruction of the upper lid. *Amer. Jour. Ophth.*, 1945, v. 28, Aug., pp. 886-889. (3 figures, references.)

Margolin, E. J. Sulfidine in the therapy of dacryocystitis. *Viestnik Oft.*, 1942, v. 21, pt. 5, p. 49.

In the conservative handling of lacrimal-sac disease, even in the presence of corneal ulcers, daily washings with the following solution: sulfidine and sodium bicarbonate aa. 0.8, with 96 percent alcohol 20, and distilled water 80, has proved successful in 17 cases.

M. Davidson.

Medviedev, N. I. Plastic correction of cicatricial shortening of the upper eyelid. *Viestnik Oft.*, 1942, v. 21, pt. 5, p. 11.

"In four cases of cicatricial contraction of the upper lid from burns, good cosmetic results were achieved by transplantation of skin from the other upper lid. The method is limited to transplants 4 to 6 mm. in width. Otherwise there would be shortening of the donor lid.

M. Davidson.

Tikhomirov, P. E. Methods of treatment of epiphora. *Viestnik Oft.*, 1942, v. 21, pt. 4, p. 30.

Complete splitting of the canaliculus for stenosis of the punctum is contraindicated in view of evidence of the active role of the canaliculus in conduction of tears. Graves's operation, found successful in nine cases, is recommended. Mild eversion of the punctum can also be corrected by Graves's operation. Its use in more serious cases has resulted in relapses. In serious cases the author excises a strip of conjunctiva 20 to 25 mm. long by 2 to 2.5 mm. wide, 1 to 1.5 mm. from the lid border, and ending in a rhombus at the

inner end. The sharp angles of the latter are placed vertically. This operation has proved successful in 46 out of 56 eyes. Any persistent mild eversion can readily be corrected by Graves's operation. Strictures of the canaliculus are treated by introduction of a discission needle and cutting through the stricture. A retention sound is then introduced, and is removed daily for five to eight days, washing out the passages before replacement. Study of 43 cases treated by the use of sounds for a presumed stenosis of the lacrimo-nasal duct showed true stenosis only in six cases. The author regards the use of sounds as giving rise to strictures and therefore not to be recommended. In lieu of extirpation of the lacrimal gland, when indicated, electrocoagulation has been found effective in 47 eyes. (Illustrated.)

M. Davidson.

Weber, F. P. Sjögren's syndrome, especially its nonocular features. *Brit. Jour. Ophth.*, 1945, v. 29, June, pp. 299-312. (See Section 5, Conjunctiva.)

## 16

### INJURIES

Awerbach, M. I. Injuries of the orbit and adjacent parts. *Viestnik Oft.*, 1942, v. 21, pt. 4, p. 3.

The incidence of injuries affecting the eye rose from 0.86 percent in the Franco-Prussian War to 10 percent in the First World War, and to 17 percent in the Spanish Civil War. In the present war injuries are mainly the result of mine explosions and are characterized by simultaneous injuries to head and extremities. The general surgeon, less familiar than the ophthalmologist with the anatomy of this region in handling these injuries,

should bear in mind that an incised wound apparently the result of the impact of a sharp object from without may be caused by a blunt object striking against the sharp edges of the upper or lower orbital margin. Otherwise he will overlook serious craniocerebral injury requiring attention. He should be on the alert for crepitation from injury of the sinuses which may not show up in the Xray; for injuries to the pulley of the superior oblique muscles; for other muscle injuries and nerve injuries; and for traumatic enophthalmos due to escape of orbital contents through the fragile lamina papyracea. Reference is made to a rare case in which the globe disappeared entirely into the ethmoid, with the appearance of traumatic anophthalmos, but with light perception via the nose reported by the patient. The general surgeon is also warned against too generous débridement of wounds and postponement or crude suturing of lid injuries so as to create serious deformities requiring plastic surgery later. Among measures to combat infection, Vishnevsky's ointment (oleum ricini, 100; xeroform and oleum cadini or oleum fagi, aa 3.0) has given good results.

M. Davidson.

Baltin, M. M. Roentgen diagnosis and localization of wartime intraocular foreign bodies. *Viestnik Oft.*, 1942, v. 21, pt. 4, p. 19.

During this war there are frequently foreign bodies both in the lids and in the globe. To facilitate X-ray localization, aluminum elevators are used to lift up or pull down the lids during the exposure. In the Baltin modification of the Comberg method of localization, use is made of an aluminum prosthesis in the shape of a segment of a sphere of from 12 to 15 mm. radius, and pro-

vided with a central hole of 11 mm. in diameter, and 0.5-mm. lead guides soldered in four perforations at 90-degree intervals, 0.5 mm. from the central perforation. When there is contraindication to introduction of the film into the conjunctival sac to secure a bonefree X ray, Baltin recommends rotation of the head 40 to 45 degrees and taking an ordinary side view. (Illustrated.) M. Davidson.

Diachkov, S. A. Craniocerebral lesions through the orbit. *Viestnik Oft.*, 1942, v. 21, pt. 4, p. 16.

Multiplicity of injuries resulting from fragments, in particular those due to mine explosions, characterizes this war. The eye injuries themselves are also likely to be multiple. Craniocerebral injuries via the orbit may escape the notice of both ophthalmologist and neurosurgeon in the absence of careful X rays. After injury apparently to the eye only, and enucleation of the eye, evidence of craniocerebral injury may appear two to four days later, and may result either in a brain abscess or a diffuse meningitis. The previous methods of handling such cases have had to be revised. The writer observed eight such cases in 1941. The first four died under conservative treatment recommended by neurosurgeons, who were guided by general principles of treatment of open-skull injuries. The deaths were either from diffuse meningitis or from brain abscess. The subsequent four cases were handled by exenteration of the orbit with conservation of the periosteum, débridement of the orbital wound, removal of fragments, and isolation of sinuses from the cranial cavity. One case had a brain prolapse, three other cases had ethmoidal involvement. All four recovered. Since

then a fifth case, diagnosed only 2½ months after enucleation of an eye with retention of a shell fragment lodged partly in the middle fossa and partly in the orbit near its apex, was successfully operated upon with recovery. In such cases, therefore, the only effective method is exenteration of the orbit.

M. Davidson.

Krol, A. G. The inexpediency of evisceration in war injuries to the eye. *Viestnik Oft.*, 1942, v. 21, pt. 5, p. 28.

With the diagnosis of panophthalmitis, eviscerations are done more precipitately in war injuries than in times of peace. At operation on four such cases of pseudopanophthalmitis following crushing injuries of the globe, the error was discovered and the ever-present fear of sympathetic ophthalmia following evisceration was eliminated. It is therefore recommended that first the necrotic cornea be excised, and that, when there is no evidence of panophthalmitis on further inspection, enucleation be proceeded with, after suturing the opening in the globe. Because of adhesions of muscles to the globe in such cases, tenotomy hooks are of little use. M. Davidson.

Shilin, J. V. Restoration of the cavity of the conjunctival sac by means of electrocoagulation. *Viestnik Oft.*, 1942, v. 21, pt. 5, p. 22.

In this war one third of all eye injuries are perforating injuries, and in 40 to 50 percent of the latter enucleation is required. Cicatricial bands in the sockets often prevent wearing a prosthesis. Electrocoagulation has been found very effective for elimination of these bands. But a fine sewing needle has been found superior to any cutting electrode. Only in cases of widespread general contraction of the socket have

relapses occurred. The prothesis is put in immediately. The method has been found useful in dealing with symblepharon. M. Davidson.

Strakov, V. P. The surgeon's conduct as to war injuries to the visual organ. *Viestnik Oft.*, 1942, v. 21, pt. 4, p. 12.

In the present war the visual apparatus has been subject to many and complicated injuries. Immediate attention at the front has to be provided by general surgeons as well as by ophthalmologists. Suturing of lid wounds must be done as early as possible, and may be done within one or two weeks with excellent results. However, in the presence of deeper wounds communicating with the sinuses, early suturing should be avoided. Suturing of lacerations of the lower fornix should begin from below, and the suture line should be made to run upward and inward in order to prevent epiphora. Plastic repair has been found practicable within from two to six months after injury. In doing this, care should be taken to free underlying muscle from scar tissue, so that the muscle may function well afterward. Conjunctival flaps are not considered advantageous in corneal injuries. If the corneal wound is already healed they are not necessary. Infection rarely follows either excision or replacement of a prolapsed iris. Cases of infections under the flap have been observed. The flap often slides back. It sometimes remains adherent so that later excision and perhaps iridectomy becomes necessary. The flap may interfere with X rays and ophthalmoscopy in the presence of a complicating foreign body.

Intraocular foreign bodies have been frequent in this war. When lodged in the cornea spontaneous extrusion has

been frequently observed. Lead particles have been observed as lustrous globules and are well tolerated. Magnetic particles deep in the cornea can be removed more readily by incision and magnet than by keratotomy and spatula. A conjunctival suture is indicated for small scleral wounds but not for large ones. Immediate enucleation of eyes, previously regarded as tending to prevent sympathetic ophthalmia, should be discouraged. The 10 to 14 days incubation period of sympathetic ophthalmia gives ample time for judgment as to its necessity. An eye apparently blind from orbital hemorrhage may entirely recover. When removal is indicated in the presence of infection, evisceration is less dangerous. More magnet extractions are performed in this war than in previous wars. Cuts over the ciliary body have also been more numerous. Frequently, therefore, later enucleation for iridocyclitis has been done at base hospitals. It is, therefore recommended that case histories be kept together in one institution, and preferably in the institution where treatment took place.

M. Davidson.

Sverdlov, D. G. Early prothetization of the conjunctival cavity by special prothesis dilators as a prophylactic measure against posterior contractions. *Viestnik Oft.*, 1942, v. 21, pt. 5, p. 31.

Normally, after enucleation or evisceration, an artificial eye can be worn with comfort in 14 to 16 days. But often, because of pain and discharge, the artificial eye is not worn for several months. By the end of that time the socket is found too much contracted for the prothesis. The discharge moreover is often simply the result of not wearing the prothesis. To prevent contraction, special socket dilators of vari-

ous sizes are employed. They are flatter than the ordinary artificial eye and have a hole in the center which permits inspection of socket and its irrigation, avoiding removal for cleansing for five or six days at a time. They are put in at times immediately after operation, generally within two days, and are worn until the permanent prosthesis is tolerated. Good results are usually achieved in eight days. In only five out of thirty cases were they ineffective, because of extraordinary inflammation and scar formation following burns in two, and crushing injuries in three. (Illustrated.) M. Davidson.

Tikhomirov, P. E. Indications and techniques of the magnet test for intraocular war splinters. *Viestnik Oft.*, 1942, v. 21, pt. 5, p. 17.

While in industrial accidents intraocular foreign bodies are magnetic in 93.5 percent and the magnet test unnecessary, in war injuries the particles may be nonmagnetic in a considerable proportion of the cases. They are also commonly multiple. In the war with Finland 35 percent of the intraocular foreign bodies were nonmagnetic, so that in 93 percent the magnet test had to be resorted to. The anamnesis, helpful in industrial accidents, is not available in the case of enemy bullets and shrapnel. The magnet test should not be applied blindly, that is to say, should not be guided merely by the sensation of pain as if this were its purpose. When the foreign body is in the anterior chamber, iris, or lens, the purpose of the test is principally to magnetize an otherwise weakly magnetic body and dislodge it. It may therefore be repeated with increasing strength. When the foreign body is in the ciliary body, use of the magnet must be preceded by careful X-ray localization.

Since pain may be elicited, the current must be very weak to start with. When the foreign body is in the vitreous and visible ophthalmoscopically, the magnet test must be done under ophthalmoscopic control. M. Davidson.

## 17

## SYSTEMIC DISEASES AND PARASITES

Abreu Fialho, Sylvio de. Ocular manifestations of brucellosis. *Rev. Brasileira de Oft.*, 1945, v. 3, June, pp. 189-200.

The author first summarizes the statistics presented by Weskamp, Maftrand and Peirotti (*Arch. de Oft. de Buenos Aires*, 1943, v. 18, Dec., p. 666.) concerning the incidence of involvement of various ocular tissues. He then reports a personal experience in a white Brazilian of 25 years, who worked as cattleman on a municipal estate. Two months previously the right eye had become inflamed, with some loss of vision. This had cleared up, but at the time of the consultation the left eye was going through the same experience. The vision of this eye was reduced to 2/10, and the symptoms included moderate lacrimation, discrete photophobia, deposits on Descemet's membrane, and threads in the vitreous. There was a record of frequent abortion among the cows on the farm, and the patient habitually drank raw milk. Other examinations were negative, except that there was a good deal of dental caries. The author made only a presumptive diagnosis of ocular brucellosis, since it was impossible to hold the patient for laboratory tests. A number of other references from the literature are reviewed.

W. H. Crisp.

Hansel, F. K. Allergy in relation to

otolaryngology and ophthalmology. *Laryngoscope*, 1944, v. 54, May, pp. 238-252.

A review of the literature of the previous year regarding allergy as related to otolaryngology and ophthalmology is reviewed. In 41 cases which showed edema of the lids the etiologic agents included sleeping pills, stewed cherries, strawberries, and mechanical irritation such as plucking of the eyebrows, squeezing the margin of the lids to straighten the lashes, and dyeing the eyebrows. Orange was the offending allergen in one case, in another butyn and hydrous wool fat in an ointment of sulfathiazole which had been used in a case of chronic catarrhal conjunctivitis. Four cases are reported in which pollen extracts gave good results against vernal conjunctivitis caused by pollen sensitivity. Workers in laboratories producing cultures of the tubercle bacillus noticed systemic reactions when the fumes from boiling suspensions of dead bacilli were inhaled, and after repeated exposures cutaneous sensitivity to tuberculin became decreased. Patients affected for many years by recurrent tuberculous iritis became free from symptoms after repeated inhalations of the fumes from boiling suspensions of tubercle bacilli. Animal experiments showed that sensitized guinea pigs could be desensitized by repeated inhalations of the fumes. (References.) M. Lombardo.

18

HYGIENE, SOCIOLOGY, EDUCATION,  
AND HISTORY

Davidson, Morris. Status of compensation for ocular injuries in the United States. *Amer. Jour. Ophth.*, 1945, v. 28, Aug., pp. 856-871. (1 chart, 3 tables, references.)

Gaetjens, A. K. Illumination and industrial visual tasks. *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1945, 49th mtg. May-June, pp. 303-310.

The respective fields of eyesight specialists, industrial psychologists, and illuminating engineers are defined. Luminosity of 30 to 50 foot-candles, well diffused, usually using fluorescent lamps, has largely replaced the 5 to 10 foot-candles used previously. Eye comfort and actual visibility of the task are considered of especial importance. The latter is obtained partly by making the area of the actual visual task as bright as the surroundings, by sufficient general luminosity, use of light-colored enamel reflectors, and supplementary illumination. (7 illustrations.)

Charles A. Bahn.

Harrison, G. H. Eye safety devices. *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1945, 49th mtg., May-June, pp. 297-298.

In this country, 300,000 industrial eye accidents occur yearly necessitating absence from work. The cost is over a hundred million dollars yearly, suffering excluded. As a result of industrial injuries, 80,000 are blind in one eye and 8,000 blind in both eyes. Of these accidents 98 percent are unnecessary. Among the major causes are the nonuse or misuse of efficient safety devices. For example, protecting glasses must be adapted to the individual needs. They must be correctly and comfortably fitted and they must be kept clean and in good repair. Above all, they must be worn on the workman's face the entire time he is working. Only too often they are given out like a lot of patent-medicine samples to be used as, if, and when desired. In recent surveys more than 50 percent of workmen were found to have defective



vision or to lack protective glasses for their work. Charles A. Bahn.

Hurst, Hazel. Placement of the blind in industry. *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1945, 49th mtg. May-June, p. 310.

The author, who is blind, conducts a school for the visually handicapped in which placement of the blind in industry is emphasized, and 375 of the students have been placed in various industrial plants during the past three years. A guide dog is kept at the employee's bench during the eight-hour shift, especially to avoid confusion in case of emergency. The author feels that a regular periodic check-up of ocular condition and general health should be made on all sightless employees. Their record for attendance and willingness to work is excellent, and there is less absenteeism among the blind than among those with sight.

Charles A. Bahn.

Lo-Presti, Joseph. The Connecticut

experience with eye problems in small industries. *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1945, 49th mtg., May-June, pp. 298-303.

Special eye services were made available through use of an ophthalmologist in 73 percent of the plants. In 66 percent the only screening test used was the visual-acuity test for distance. Periodic rechecks of vision were obtained for all employees in 20 percent of the plants. Wearing goggles was enforced by warning in 79 percent of the plants, but that this failed to be generally effective was shown by inspection trips through the plants. No reconditioning of individual equipment was done in any plant, yet all complained of the scarcity of the goggle supply. Most needed in visual safety are adequate visual screening methods and increased industrial nursing service under the supervision of the plant ophthalmologist or the medical director. Detailed practical instructions for removal of foreign bodies, burns, and so on are given in this article. Charles A. Bahn.

# NEWS ITEMS

Edited by DR. DONALD J. LYLE  
904 Carew Tower, Cincinnati 2

News items should reach the editor by the twelfth of the month

## DEATHS

Dr. Charles W. Cole, Norton, Kansas, died May 20, 1945, aged 67 years.

Dr. Martin I. Green, San Francisco, California, died June 30, 1945, aged 46 years.

Dr. Milton T. Jay, Portland, Indiana, died May 25, 1945, aged 77 years.

Dr. James C. McLallen, Cicero, Illinois, died June 14, 1945, aged 67 years.

Dr. Arthur L. Payne, Eau Claire, Wisconsin, died May 15, 1945, aged 79 years.

Dr. Tilden H. Singleton, Bowling Green, Kentucky, died June 6, 1945, aged 68 years.

Dr. Thomas F. Welsh, Salt Lake City, Utah, died May 13, 1945, aged 45 years.

Dr. Thomas J. Williams, Chicago, Illinois, died August 10, 1945, aged 63 years.

## MISCELLANEOUS

Particularly since the end of the war with Germany and Japan, it is likely that there will be need for additional volunteers for abstracting from foreign eye journals. Dr. William H. Crisp, 530 Metropolitan Building, Denver 2, would appreciate receiving information as to ophthalmologists who would be able and willing to abstract from French, German, Italian, Spanish, Portuguese, or any other foreign languages.

## REQUIREMENTS FOR FELLOWSHIP IN THE AMERICAN COLLEGE OF SURGEONS

The Board of Regents of the American College of Surgeons, at a meeting held on June 24, 1945, took the following action:

1. That the College may recognize certification by the Board of Surgery or by a Surgical Specialty Board as evidence that the candidate has met the professional qualification requirements for fellowship in the American College of Surgeons. Each candidate will, however, be required to meet the ethical, personal, and professional qualifications established as standard for fellowship in the College. The following statement will appear in the revised "Requirements for Fellowship" in the College:

Candidates who have been recommended for fellowship by the Committees on Credentials and who have been certified by one of the following Boards, may be exempted from the requirement of submitting case records, or they may be required to submit only one half of the usual number of case records, that is, 25 records:

American Board of Neurological Surgery  
American Board of Obstetrics and Gynecology  
American Board of Ophthalmology

American Board of Orthopedic Surgery  
American Board of Otolaryngology  
American Board of Plastic Surgery  
American Board of Surgery  
American Board of Surgery (Proctology)  
American Board of Urology

2. That applicants for fellowship whose qualifying medical degree shall have been obtained after January 1, 1944, shall be required to present evidence of having completed a minimum of four years of hospital service and graduate study of the basic medical sciences as they pertain to surgery in one or more acceptable hospitals and medical schools, of which three years shall have been spent in training in surgery or the surgical specialties in hospitals approved for such training by the American College of Surgeons. In the case of ophthalmology or otolaryngology, the period of training required shall be not less than three years, of which two years shall have been spent in hospitals approved for such training by the American College of Surgeons; and in the case of the combined specialty, ophthalmology-otolaryngology, the period of training required shall be not less than four years, of which three years shall have been spent in hospitals approved for such training by the American College of Surgeons. In the case of graduates of medical schools which withhold the medical degree until after the year of hospital internship, the date set will be January 1, 1945.

Irvin Abell, M.D.,  
Chairman, Board of Regents

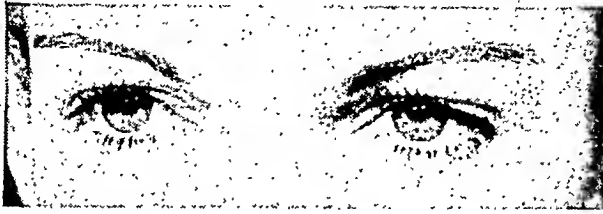
The fifteenth semiannual Postgraduate Conference in "Neuromuscular anomalies of the eyes" will be held at The Children's Memorial Hospital, in Chicago, by Dr. George P. Guibor, from October 21 to 26, 1945, inclusive. The class will be limited. No applications will be accepted after October 16th. A fee of \$50 will be charged, \$25 payable on enrollment, balance payable on registration. All correspondence and checks should be addressed to The Children's Memorial Hospital, 700 Fullerton Avenue, Chicago 14, Illinois.

The nineteenth annual Spring Graduate Course in Ophthalmology and Otolaryngology will be held at the Gill Memorial Eye, Ear, and Throat Hospital, Roanoke, Virginia, April 1 to 6, 1946.

## PERSONALS

Among the guest speakers in the Jackson County Health Forum lecture series will be Dr. Derrick Vail, who will speak on March 20, 1946, on "Save your eyesight."

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CHRONIC POSTTRAUMATIC SYNDROMES LEADING  
TO ENUCLEATION\*

BERTHA A. KLIEN, M.D.

Chicago

It has often been stated that chronic nonspecific infiltrating iridocyclitis (iritis serosa) is the most frequent and important posttraumatic condition leading to enucleation on suspicion of sympathetic ophthalmia. The results of the studies reported in this paper show that there are several other conditions in this category, some of which are equally important or frequent.

The 77 eyes included in this study were selected from a total of 219 eyes with penetrating injuries received for histopathologic examination during the past 15 years. Eyes injured so severely that they had to be removed within a few days of the trauma, those which, although quiescent, were removed years later for purely cosmetic reasons, and those which clinically presented an obvious suppurative intraocular process were omitted from this study.

The eyes selected for this study had in common a chronic low-grade painful state of irritation or inflammation, which at the time of their removal invariably raised a suspicion of sympathetic ophthalmia.

These eyes are classified into two general groups as follows: (1) Those in which the terminal inflammation was

continuous with the immediate post-traumatic reaction (table 1), and (2)

TABLE 1

GROUP 1. TERMINAL INFLAMMATION FOLLOWING  
POSTTRAUMATIC REACTION WITHOUT  
QUIESCENT INTERVAL

Type of Lesion	A*	B†	Special Remarks
Chronic septic endophthalmitis	20	16 wks.	3 foreign bodies (plant, glass)
Extensive tissue necrosis	6	5½ wks.	
Sympathetic ophthalmia	3	5 wks.	One (glass and hair)

\* Number of cases.

† Average interval between injury and enucleation.

TABLE 2

GROUP 2. QUIESCENT INTERVAL BETWEEN POST-  
TRAUMATIC REACTION AND TERMINAL  
INFLAMMATION

Types of Lesion	A*	B†
Sympathetic ophthalmia	3	22 wks.
Chronic infiltrating iridocyclitis	17	50 wks.
Endogenous iridocyclitis	4	
Chronic hemophthalmos	6	42 mos.
Epithelial implant	9	7 yrs.
Cyst of new Descemet's membrane	2	
Rupture of degenerated lens	1	
Retinal disinsertion, late iritis	6	12 yrs.

\* Number of cases.

† Average interval between injury and enucleation.

those in which a quiescent interval varying from several weeks to years preceded the activated state of inflammation which prompted their removal (table 2).

\* From the College of Medicine, University of Illinois. Read before the Chicago Ophthalmological Society, March 19, 1945, as part of a symposium on eye injuries.

Some of the clinical as well as histopathologic features of the aforementioned conditions will be discussed.

#### GROUP 1

(a) *Chronic mild septic endophthalmitis*. The clinical course was characterized by moderate photophobia and pain, and moderate to marked ciliary injection of the injured eyes. Whenever examination of the deeper structures was possible there was some visibility of the slitlamp

(b) *Extensive tissue necrosis*. In these six eyes the penetrating injury (two by rocks, one each by buckshot, BB shot, wood, golf club) was accompanied by marked contusion. Clinically the predominant finding was a complete hyphema which remained stationary throughout the time of observation, without any signs of absorption. Two of these eyes developed blood staining of the cornea, three a secondary glaucoma.

Histologically the most striking feature

TABLE 3  
SYMPATHETIC OPHTHALMIA (6 CASES)

Patient	Age	Type of Injury	A*	B†	Second Eye
B. C.	28	Glass	None	5 wks.	Normal
G. S.	37	Scleral rupture (fist)	None	3 wks.	Normal
J. M.	4	Glass	None	5 wks.	Precip. 4 da.
J. H.	10	Auto accident	3 wks.	6 wks.	Precip. 10 da.
B. F.	67	Unknown	?	1 yr.	Aq. cells 1 da.
J. C.	21	Glass	4 wks.	10 wks.	Precip. 4 da.

\* Quiescent interval between posttraumatic reaction and first symptom.

† Time interval between injury and enucleation.

beam in the aqueous and occasionally a moderate increase in the number of free cells but no corneal precipitates, in contradistinction to the infiltrating iridocyclitis in which precipitates were abundant.

The histologic picture was characterized by a localized focus of polymorphonuclear leucocytic exudate somewhere along the intraocular path of the penetrating scar, which, depending on the length of time between injury and enucleation, was walled off by a more or less well-developed fibrous capsule. In several cases the abscess was inside the injured lens, well walled off from the other tissues by lens capsule and cortex. In three instances, a foreign body (plant, glass, unidentified) was found within the encapsulated abscess. There were mainly round cells in the other intraocular tissues.

Should such an eye not be removed an atrophía bulbi with retinal detachment would be the expected outcome.

was necrosis of large portions of the uveal tract and the retina, and free hemorrhage into some or all of the intraocular chambers. There was also mild infiltration with lymphocytes and monocytes of the tissues bordering on the necrotic parts.

Such extensive areas of tissues disintegration exert apparently a chemotactic stimulus upon surrounding vascular beds and upon wandering cells in the adjoining tissues, which result in migration and proliferation of various phagocytes and white blood cells, accumulations of which infiltrate in and around the necrotic areas. Extensive tissue necrosis also interferes with the various mechanisms for the absorption of hemorrhage, which ordinarily are very efficient, especially in the young, and often bring about regression of a hemophthalmos in a surprisingly short time. A hemophthalmos following a penetrating injury with a sharp, cutting

object would therefore seem to have a better prognosis as to absorption of the hemorrhage and restitution of some vision, than that resulting from a perforating trauma with an element of contusion.

(c) *Sympathetic ophthalmia*. The accompanying table (table 3) illustrates

themia. The exciting eyes were removed in two cases four days after precipitates developed in the fellow eye, in one case one day after, and in one case not more than 10 days after this occurrence.

#### GROUP 2.

(a) *Chronic posttraumatic infiltrating*

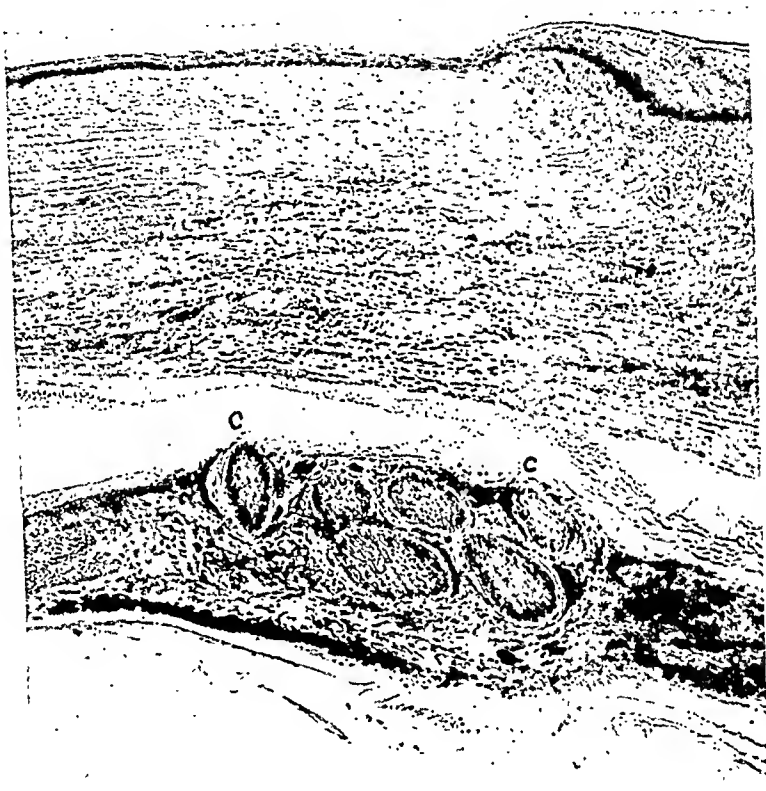


Fig. 1 (Klien). C, cross section of cilia in iris, chronic infiltrating iritis.

that three of the six cases of sympathetic ophthalmia had no quiescent interval between injury and enucleation. In the other three the quiescent intervals were three weeks, four weeks, and one year, respectively. In four of these patients the fellow eye was involved at the time of enucleation. These four include the three eyes with a quiescent interval, a fact which suggests greater vigilance over eyes with the type of injury which assertedly often leads to sympathetic oph-

themia. Clinically the interval between the traumatic reaction and the appearance of the corneal precipitates in the injured eye is short, usually 8 to 14 days.

The histopathologic findings in this condition have been described in great detail by E. Fuchs,<sup>1</sup> A. Fuchs,<sup>2</sup> and Samuels.<sup>3</sup> The main characteristic is an iris densely packed with lymphocytes, or a mixture of lymphocytes and plasma cells and a relative absence of inflamma-



tory changes in the ciliary body, even in those instances in which such are found in the posterior segment, where they consist of an infiltration in the retina similar to that in the iris.

The etiology of this condition has been

uveitis on histologic examination. In both, the uveitis was bilateral, beginning in the injured eye, and a physical reëxamination revealed marked sensitivity to tuberculin. In two other cases the eye had suddenly become painful and inflamed after 7 years



Fig. 2 (Klien). Endogenous iritis in eye injured 40 years ago. P, precipitate.

much discussed but has never been fully clarified. Samuels pointed out the high incidence of open lens injuries and considers it possibly identical with the phacoanaphylactic inflammation of Verhoeff and Lemoine.<sup>4</sup>

In our series of 17 eyes only two had no open lens injury. In one of these two a group of six cilia was imbedded in the iris (fig. 1).

(b) *Endogenous iritis*. Two of these cases were found to have a tuberculous

and 40 years, respectively, in both patients during an attack of influenza, the eye representing perhaps a locus minoris resistentiae. There were corneal precipitates in both, and an acute rise of tension to 80 mm. Hg (Schiøtz) in one of them. The latter eye had a peripheral anterior synechia over one quarter of the circumference, due to an adherent leucoma, and a hypermature cataract, factors which may have precipitated the rise of tension. Figure 2 illustrates the narrow but open

anterior-chamber angle in this eye, which was enucleated seven days after the onset of the inflammation. Clumps of swollen round cells line the surfaces and infiltrate the trabeculum and the stroma of iris and ciliary body.

(c) *Chronic hemophthalmos.* The

foreign body could be demonstrated, but there was a profuse intraocular hemorrhage. After several weeks the patient was discharged with the right eye quiescent and with vision of only light perception. During the following four years there were several recurrent attacks of

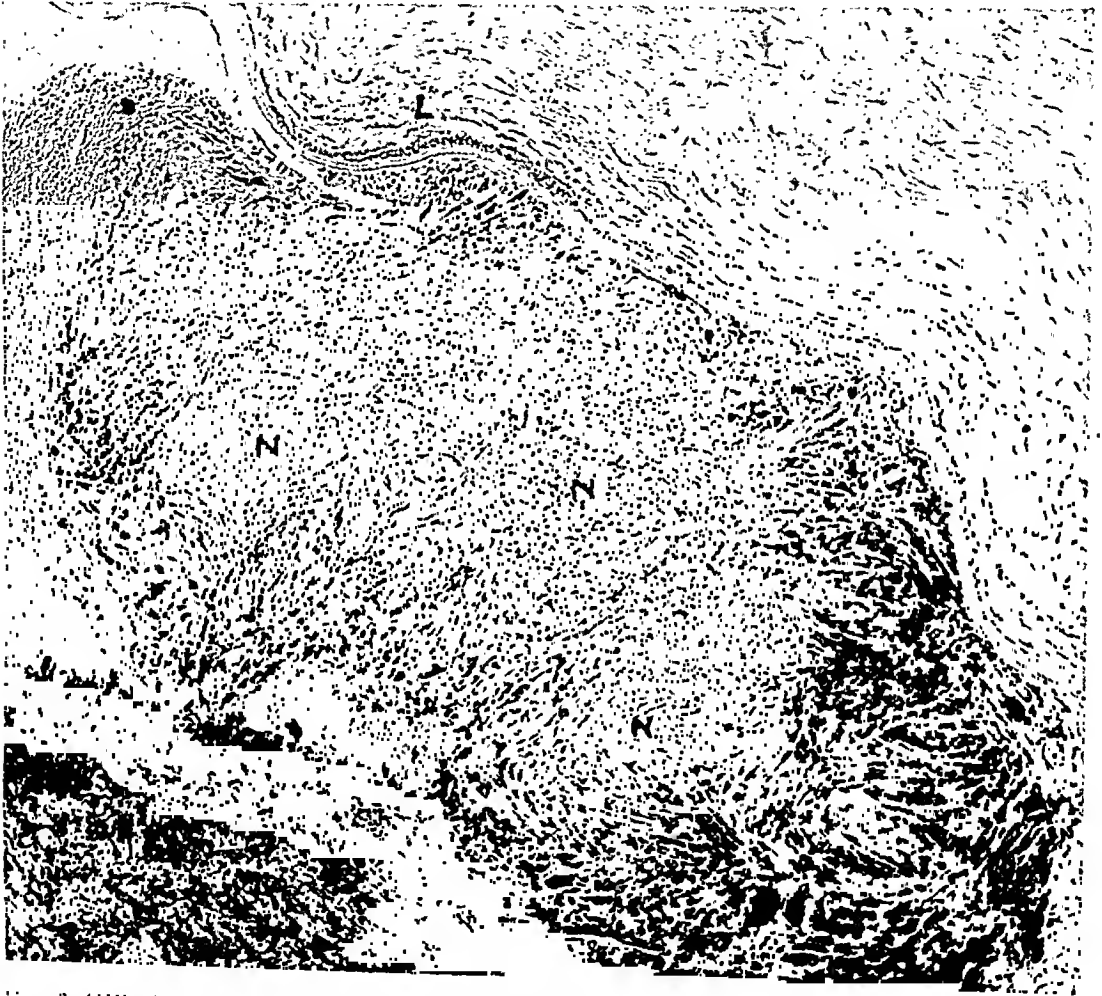


Fig. 3 (Klien). Cholesterin tumor in anterior chamber. N, necrotic areas. L, polymorphonuclear leucocytic infiltration in cornea.

course of this condition is well illustrated by the following case history: O. T., a boy aged 13 years, sustained an injury to his right eye by a piece of glass from an exploding bottle, which resulted in two perforations: one in the lower third of the cornea, and one in the superior sclera 1.5 cm. from the limbus. No intraocular

pain and redness in this eye, which always quieted promptly after atropinization. At the time of the enucleation, four years after the injury, vision with the right eye was nil. There were marked photophobia and ciliary injection of the bulb. Through the upper clear two thirds of the cornea a conglomerate mass of yel-

lowish refractile bodies was visible in the anterior chamber, and numerous small refractile bodies were suspended in the aqueous and were considered to be cholesterol crystals. There were no corneal precipitates, and the intraocular pressure had not been elevated at any time. The blood cholesterol level was within normal limits.

Histologic examination verified the

ent infiltration with polymorphonuclears just in front of Descemet's membrane. In the iris and ciliary body there was only slight round-cell infiltration. The lens was cataractous and had been partly absorbed. There was a complete retinal detachment due to an extensive disinsertion.

In attempting to project the histologic findings into the known clinical picture

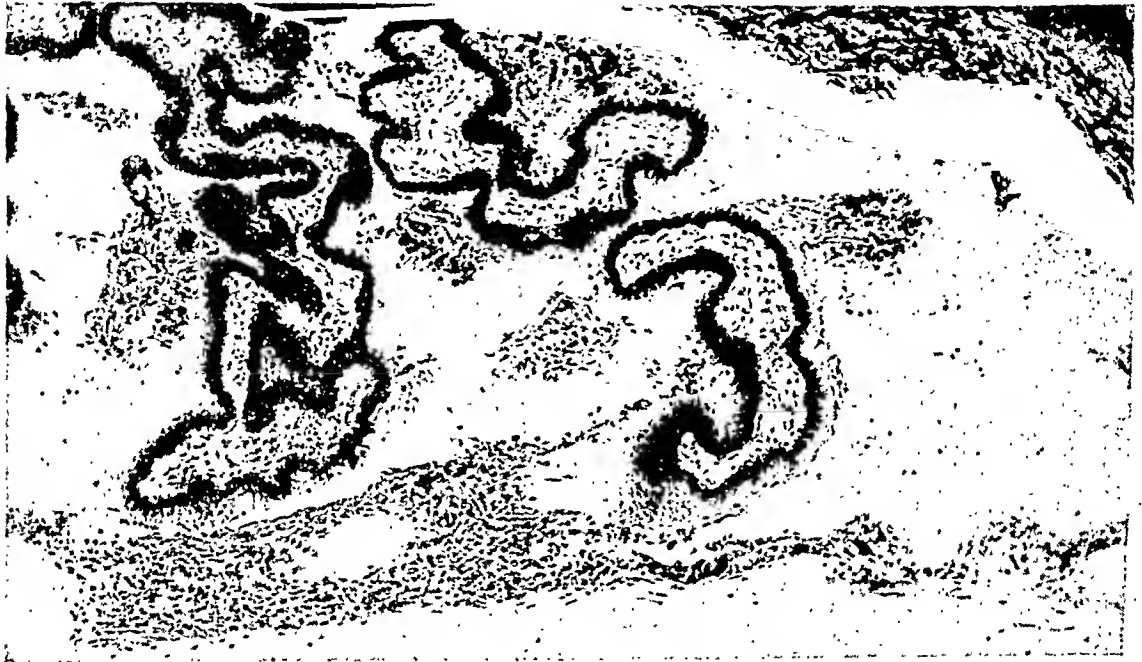


Fig. 4 (Klien). Multiple cholesterol tumors between ciliary processes.

clinical diagnosis of cholesterol in the anterior chamber. The tumefaction (fig. 3) consisted of clumps of foreign-body giant cells, monocytes, and some round cells and fibroblasts around empty slit-like spaces, which always indicate cholesterol needles *in vivo*. Similar but smaller cholesterol tumors were applied here and there to the anterior surface of the iris, and to the ciliary processes and valleys (fig. 4). In the central portion of the large cholesterol tumor in the anterior chamber there were several necrotic areas surrounded by some polymorphonuclear cells. In the portion of the cornea adjoining this tumefaction there was an incipi-

one comes to the conclusion that the attack of pain and redness just prior to the enucleation was caused by disintegration of portions of the large cholesterol tumor, the toxicity of the by-products of this process leading to an aseptic infiltration of the mass and the adjoining cornea with polymorphonuclears, similar to the infiltration in ring abscess of the cornea, which is also a purely toxic manifestation. The intermittent attacks of pain and redness of this eye during the four-year period of observation, which were so easily controlled with atropine, may have been due to irritation of the ciliary processes and the iris by the sharp cholesterol

crystals in the early stages of their formation before giant cells were able to surround them and render them less irritating.

In the series of six eyes with chronic

cholesterin were removed because of recurrent attacks of pain and complete loss of light perception after a period of  $2\frac{1}{2}$  and 4 months, respectively. Extensive retinal disinsertions with complete hem-



Fig. 5 (Klien). Epithelial implantation cyst. D, detached and new-formed Descemet's membrane.

hemophthalmos, four showed extensive formation of cholesterol tumors and other findings similar to those just described. The two hemophthalmic eyes without

ophthalmos and, in one of them, iridodialysis, were found histologically. No note of the intraocular pressure was made clinically in either instance,

(d) *Epithelial implants.* Secondary glaucoma, which is considered the most frequent complication of epithelial implants, was present in only three of the nine eyes. In the remaining six, the implants in some cases extended through part of the anterior chamber and also parts of the more posterior structures, whereas in other cases they were entirely within the iris, lens, or posterior chamber, forming cysts filled with fluid and cell

trating scar at the inferior nasal limbus. The nasal half of the anterior chamber was filled with a cystic body whose temporal wall was glistening and wrinkled, and was considered to be detached or new-formed Descemet's membrane. The size of the cyst varied on different days, and the number and depth of the parallel folds of its temporal wall changed with its size. The aqueous was clear, the lens cataractous, the intraocular pressure nor-



Fig. 6 (Klien). Cyst of Descemet's membrane. E, endothelogenous connective tissue.

debris. The following case, which was also observed clinically, is characteristic:

G. B., a woman 48 years of age, had incurred a penetrating injury of the left eye with a stick of wood at the age of four years. After the initial posttraumatic inflammation had subsided, there was no pain nor redness of this eye until seven weeks prior to the enucleation. Vision with the left eye was light perception and correct projection. There were mild ciliary injection of the bulb, and an old pene-

mal throughout the period of observation.

Histologically the cyst was revealed to be an epithelial implantation cyst, whose temporal wall (fig. 5) was formed by partly detached and partly new-formed Descemet's membrane. The main part of the cyst was embedded in the iris, where it was multilocular and partly surrounded by foci of lymphocytic infiltration. These foci were the only inflammatory manifestation in the entire eye. There was no

evidence of glaucoma in either the anterior or the posterior segment. The state of this eye at the time of the enucleation was that of an irritation rather than an inflammation, perhaps due to a varying amount of traction exerted upon the iris root and its nerves by the cyst in its variable stages of fullness.

A different type of cyst is illustrated in figure 6. The wall of this cyst consists

with the left eye remained impaired, but there was no pain nor redness of this eye afterward until three weeks prior to the enucleation, when the patient noted a white mass in the eye.

Vision was now nil, there was ciliary injection of the bulb, the anterior chamber was deep and filled with a vibrating mass of iridescent pearls, which were interpreted as Elschnig's globules—that is,



Fig. 7 (Klien). Elschnig's pearls in anterior chamber.

entirely of Descemet's membrane and endothelogenous connective tissue.

(*e*) *Rupture of degenerated lens.* Another interesting illustration of an eye with an old penetrating injury which became suddenly troublesome is the following case, which also was observed in detail clinically:

L. L., a man 70 years of age, had received, at the age of 30 years, a perforating injury of the left eye by a piece of steel that was at once removed. Vision

profusely proliferated and degenerated lens-epithelium cells—and which protruded partly from the pupil, partly from a hole in the iris (fig. 7). Here and there, between the iridescent beads, there were highly refractile needles. The intraocular pressure was normal.

Histologic examination revealed a partly calcified lens with a ruptured capsule and surrounding masses of proliferated vesicular lens epithelium, fatty granular cells, and slitlike spaces (after cholesterolin

crystals) in the posterior chamber, anterior vitreous, and anterior chamber. Figure 8 illustrates chains and clumps of small, partly collapsed cystic bodies in the angle of the anterior chamber, representing old Elschnig globules, all of which have lost the nucleus and consist only of a very attenuated wall.

Liberation of degenerated and irritating substances by an apparently spon-

achment, a type of iritis usually classified as toxic.

#### SUMMARY AND CONCLUSIONS

Among the inflammatory and other posttraumatic chronic conditions that led to the enucleation of the 77 eyes reported in this series, nonspecific infiltrating iridocyclitis, far from being the most frequent condition encountered, occurred in



Fig. 8 (Klien). Histologic view of Elschnig's globules (G) in chamber angle. Same case as figure 7.

taneous rupture of the lens capsule produced the state of irritation which led to the removal of this eye.

(f) *Extensive retinal disinsertion and detachment.* Six eyes exhibited this condition, in which a mild late iritis necessitated enucleation. Histologically the iritis was revealed to be an unspecific infiltrating type and was considered secondary to the long-standing retinal de-

only 17 eyes, or 22 percent. More frequent was chronic septic endophthalmitis, in 20 eyes or 26 percent. Four other conditions comprised more than one third of all the cases; namely, epithelial implants (12 percent), chronic hemophthalmos, extensive contusion necrosis, and late toxic iritis after longstanding retinal detachment (8 percent each). Endogenous iridocyclitis occurred in 5 percent, and



some rarer conditions totaled 3 percent. Sympathetic ophthalmia itself occurred in only 6 eyes or 8 percent (less than 3 percent of the 219 penetrating injuries).

There were no findings in any of the eyes in this series to suggest that they

could have been saved. Even though there are no suggestions for the therapist it is hoped that some points of interest to the clinician as well as the pathologist have been brought out.

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### RECONSTRUCTION OF THE LIDS\*

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For the purpose of this presentation, only those cases in which replacement of all the layers of one or both lids is required will be considered. It is necessary to reconstruct all or part of the lower lid much more frequently than the upper because of: (1) the more exposed location of the lower lid; the upper orbital margin and tissues of the brow serving to provide greater protection for the upper lid from trauma, and, (2) the much greater frequency of malignancy in the lower lid.

Whether the lid is absent through trauma or because of surgical removal the problems involved are the same. The term blepharopoiesis is applied to the procedure of reconstruction of the lid where all or a major portion of it is entirely absent. A basic principle can be stated at the outset; namely, that when it is necessary to provide new lid structures nothing replaces lid tissue so well as lid tissue itself, both functionally and cosmetically.

The lids may be divided, for surgical purposes, into two layers: the outer, con-

sisting of all the tissues down to, but not including, the tarsus; and the inner, consisting of tarsus and conjunctiva. Each of the layers has its epithelial covering—namely, skin and conjunctiva—each of which is important functionally: the skin, to provide a thin flexible external covering, and the conjunctiva, for a smooth mucous-membrane lining internally as a protection to the cornea.

When it becomes necessary to replace these layers it can readily be done by a sliding or a free graft from one of the other lids, provided, of course, relatively normal lid tissue can be found either in the opposing lid or the lids of the opposite eye.

Fortunately a lower lid, which it is more frequently necessary to rebuild, is more easily fashioned than the upper, since (1) the tissues needed may usually be obtained from the opposing upper lid, (2) it is smaller in size, and also (3) the main muscle of the lower lid, the various fibers of the orbicularis, are relatively unimportant functionally, so that one does not need to be concerned with its motility. For a proper result, in the upper motility must be carefully preserved.

\* This article is based on a paper read before the Pittsburgh Ophthalmological Society.



## I. LOWER-LID RECONSTRUCTION

For total reconstruction of a lower lid many methods have been advocated, using pedicle and sliding flaps from the skin of the face (nearby) such as the methods of Dieffenbach,<sup>1</sup> Fricke,<sup>2</sup> Imre,<sup>3</sup> and others. A pedicled graft of skin of the arm has been used, as in the Italian method, in which the arm is placed above the head and a pedicle graft so planned that the skin at the end of it may be used for the eyelid. The arm is securely fastened over the head for 10 to 14 days before the pedicle is severed. The skin provided by these methods is, of course, much thicker and less flexible than is normal lid skin. Several surgeons have devised methods using tissues of the opposing upper lid (Landolt,<sup>4</sup> Valude,<sup>5</sup> Dutemps,<sup>6</sup> Wheeler<sup>7</sup>) with much better results. Tissues of the ear have been used as free graft (Büding<sup>8</sup>).

### A. IF OPPOSING UPPER LID IS NORMAL

When it becomes necessary to reconstruct the major portion of the lower lid, the creation of each of the two layers must be planned. In the absence of pathologic change in the opposing upper lid, the inner tarso-conjunctival portion of the new lower lid may be obtained by splitting this lid into its two component layers and pulling down the inner layer which remains attached to the conjunctiva of the fornix and to the levator tendon above at the upper tarsal margin. The lower border is denuded of its epithelium and attached to the conjunctiva of the lower fornix, thus completing the future inner layer.

Frequently, sufficient skin remains in the lower lid to provide the outer layer. The outer layer of the upper lid is fastened in place so that the lashes occupy their normal position in comparison to the position of the lashes of the opposite up-

per lid when the lids are closed. This is so planned that the lashes will be at the level of the middle of the tarsus which has been brought down from the upper lid. The skin from below is brought up and attached to the anterior part of the lower half of the tarsus and united to the lower border of the skin of the upper lid from which the upper lashes spring. Later, lashes are provided for the new lower lid and then the incision for the new interpalpebral fissure is carried out.<sup>9</sup>

**DESCRIPTION OF OPERATION IN THREE STAGES.** *First stage.* In case of carcinoma the entire thickness of the lower lid is removed, the skin and subcutaneous tissues being severed well below the margin of the tumor mass and the conjunctiva in or near the lower fornix. Laterally, the incision is carried well beyond the diseased tissue, leaving, if possible, the temporal canthus and the canthal ligament undisturbed; and medially, just temporal to the punctum lacrimalis, when it is uninvolved. This leaves a large defect in which the new lower lid is constructed. The upper lid is split transversely into two layers, the incision being started along the lid margin slightly posterior to the white line, the dissection proceeding upward, hugging the superficial layer of the tarsus to a point even with the upper fornix, and well above (about 3 to 4 mm. above) the upper margin of the tarsus. The dissection should not disturb the attachment of the levator to its upper border. Considerable care must be taken to avoid the roots of the lashes in this dissection. The inner layer is then comprised of the tarsus with its conjunctiva. The outer layer of the upper lid—namely, its skin and subcutaneous tissue with the lashes attached—is placed back in its original location. The lower epithelial border of the upper tarsus is excised, and this edge is united to the cut conjunctival margin in the lower

fornix by a fine continuous black-silk 000 suture, brought out externally at each end. The arrangement of the tissues is shown diagrammatically in cross-section in the illustrations in the original article describing this procedure.<sup>10</sup>

The skin of the cheek is undermined sufficiently to allow it to be brought upward to the level normally occupied by the lower lid, without tension. The undermined skin below is drawn upward and attached to the anterior surface of the lower half of the tarsus by means of three double-armed black-silk sutures, so that the upper border is midway between the upper and the lower border of the tarsus. The superficial layer of the upper lid is then attached to the anterior surface of the upper half of the tarsus in the same manner so that the lashes occupy a transverse straight line across the tarsus at its mid portion. The two edges of skin (the lash border of the upper lid and the upper edge of the skin pulled up from below) are aligned by a subcuticular stitch. The lashes of the upper lid are held upward against the skin of the lid by collodion so that the roots of the lashes will take an upward direction. After the collodion has dried a double layer of perforated cilkloid is put over the area, and a pressure dressing applied and left in place for four to six days. Subsequent dressings are changed at intervals of three to five days for three weeks. The eye is then left entirely closed by the complete blepharorrhaphy, except for a small space nasally at the medial canthus, until the final stage, a minimum of three months.

*Second stage.* At the end of six to eight weeks, transplantation of a hair-bearing strip of skin to supply lashes for the new lower lid is carried out. A transverse trough is dissected down to the tarsus immediately below and parallel to the lashes of the upper lid. A strip of hair-bearing skin to fit this trough is cut from the

lower portion of the opposite eyebrow and, its position being reversed so that the nasal end is placed nasally, is laid in the trough and sewn in position with minute black silk sutures. The hairs are then held down by collodion to the skin of the lower lid to start them growing in the proper direction. The lashes of the upper lid are similarly held up and a double layer of perforated cilkloid is put over the area. A pressure dressing is applied and left in position five to seven days. The dressing is changed at 5-day intervals and is removed in about three weeks.

The lashes in this strip usually fall out, and take about three months to grow again. The tarsal plate makes an excellent smooth base, and the additional raw tissues of the sides of the trough formed by the dissection supply ample mechanical and nutritional support for the graft. The proper direction of the lashes is accomplished, first, by turning the transplant so that the portion that was nasal in the right eyebrow is placed nasally in the left lower lid, and, second, by anchoring the hairs protruding from the graft to the skin below with collodion to hold their roots in the proper direction under the pressure dressing. The many fine sutures, which are placed very close to the edges of the skin and tied tightly, are picked off at the first and second dressings, one and two weeks later, respectively.

*Third stage.* After another 7 to 12 weeks, at least 3 months after the original operation, when it is seen that the transplanted lashes of the lower lid are growing properly and the lashes of the upper lid are complete, an incision is made transversely between the two rows of lashes through the skin and tarsus to open the interpalpebral fissure. The new lower lid is now complete. Every effort is made to preserve the lower punctum and the lacrimal canaliculus, to supply lacrimal

drainage if possible, but, of course, not at the expense of leaving any malignant tissue.

Variations of this procedure may need to be adopted depending on the conditions present.

#### B. IF THERE IS INSUFFICIENT SKIN

When there is insufficient skin below to reach freely up to the level of the middle of the tarsus, a free graft of full-thickness lid skin from the opposing or from the opposite upper lid is the method of choice. Occasionally, it may be necessary to use a split-skin graft from elsewhere in the body if good lid skin cannot be obtained.

#### C. IF THE TARSUS OF THE OPPOSING UPPER LID IS ABSENT

When the tarsus of the opposing lid is absent or badly deformed or diseased, the tarsus of the opposite upper lid with its covering of conjunctiva may be used. If the conjunctiva remaining on the lower part of the eyeball is insufficient to form the lower fornix, enough may be obtained by dissecting loose some of the conjunctiva of the fornix at the upper border of the tarsus to be removed and, leaving it attached to the upper border of the tarsus, using it for the lower fornix by reflecting it onto the eyeball. Sufficient conjunctiva may be obtained in this manner to supply a covering for the entire lower part of the eyeball as well as the newly planned lid. The opposing upper lid is split along its margin and the inner layer attached to the upper border of the transplanted tarsus in the lower lid. The lower edge of the outer layer of the upper lid—namely, the lash border—is attached to the skin brought up from below. A free graft of lid skin could, of course, not be placed over the free tarsal graft. Some sort of sliding or pedicle graft must be used to

provide nutrition for the transplanted tarsus.

#### D. IF ONLY A PORTION OF THE LOWER LID NEEDS REPLACEMENT

When only a portion of the lower lid needs replacement a corresponding portion of the tarsus of the opposing upper lid may be used in a manner similar to that described under 1A.

### II. UPPER-LID RECONSTRUCTION

#### A. RECONSTRUCTION FOR ONE HALF OR LESS OF THE UPPER LID

When a portion of the upper lid must be reconstructed in its entire thickness, which amounts to more than one quarter

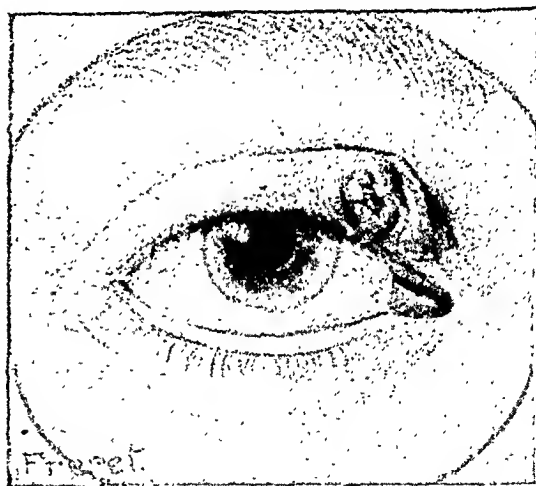


Fig. 1 (Hughes). Case of epithelioma involving the inner one quarter of the right upper lid, necessitating removal of a little over one third of the nasal portion of the upper lid throughout its entire thickness.

and less than one half of the lid structures, a sliding of the lid structures provides a very satisfactory result. This method is illustrated in the case of a malignancy of the nasal end of the upper lid (fig. 1) in which the nasal two fifths of the lid was removed in its entire thickness (fig. 2).

DESCRIPTION OF OPERATION IN THREE STAGES. *First stage.* The two layers of the missing portion were planned separately.

a. The tarso-conjunctival layer was provided by sliding all but a 2-mm. strip of the remaining tarsus along the margin of the lid, nasally into the coloboma. The remaining half of the lid was everted and an incision parallel to and 2 mm. from the lid margin was made through

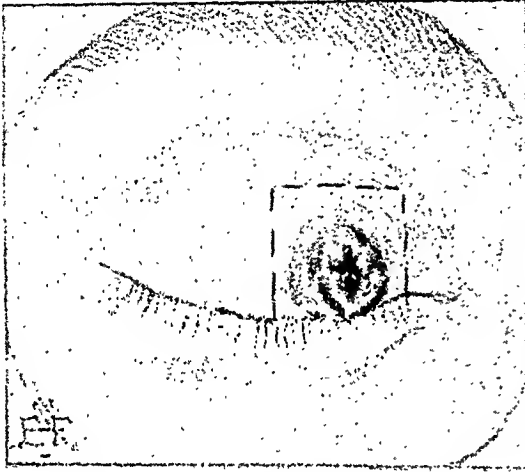


Fig. 2 (Hughes). Outline of area to be removed.

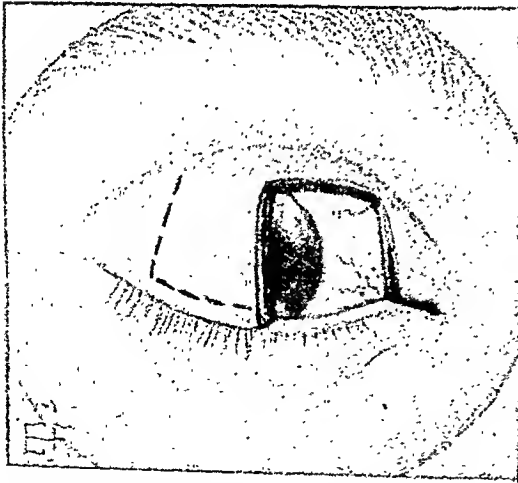


Fig. 3 (Hughes). Coloboma caused by removal. Dotted lines show the incision of the inside of the lid through the conjunctiva and tarsus. This section of tarsus remaining attached to the levator above, was mobilized and moved nasalward.

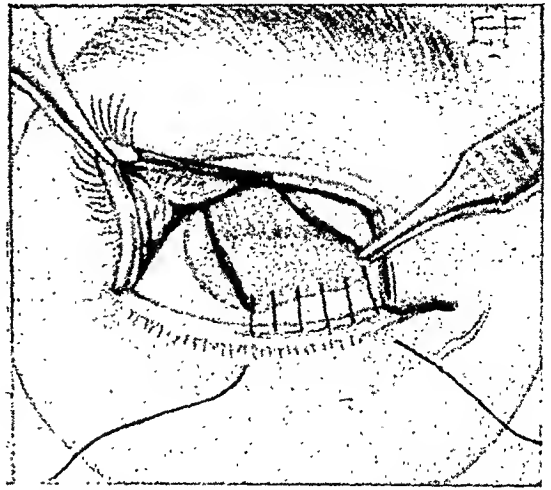


Fig. 4 (Hughes). Section of tarsus moved nasally and being attached to the lower lid.

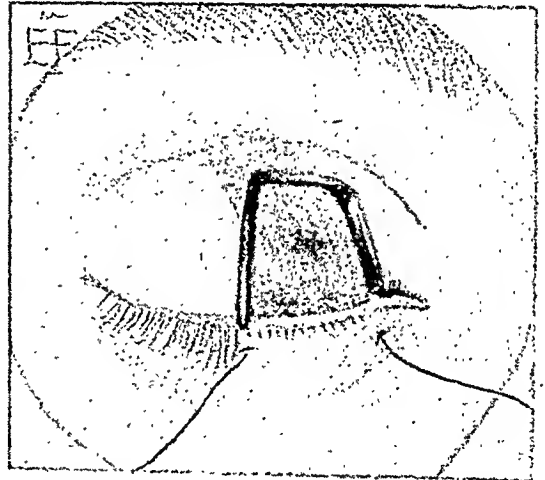


Fig. 5 (Hughes). Tarsus sewn in place, forming the inner layer of the lid in the area of the coloboma.

the conjunctiva and tarsus, extending to its lateral extremity (fig. 3). This piece of tarsus was dissected free from the superficial tissues of the lid, but the attachments of the conjunctiva in the upper fornix and the levator to the upper border were left intact. This piece of tarsus was then slid nasally and sewn in position (fig. 4). The conjunctiva in the upper fornix temporarily was freed and brought down to be attached to the remaining narrow marginal rim of tarso-conjunctiva.

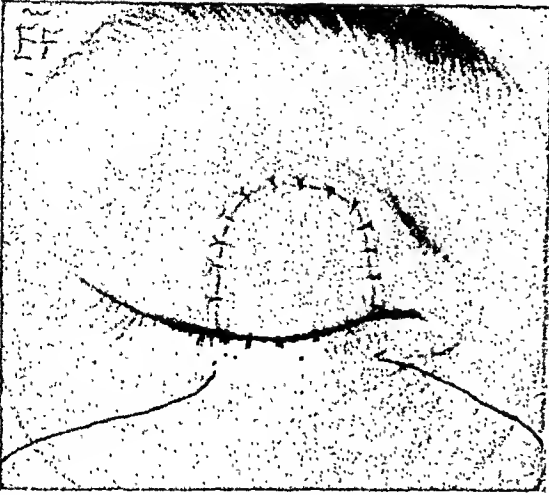


Fig. 6 (Hughes). Free graft of skin may be used as illustrated to provide outer layer of the upper lid.

The nasal extremity of the tarsal flap was attached nasally to the upper margin of the medial canthus and temporally was dovetailed into a small groove in the margin to provide an overlapping union with the remaining temporal portion of the lid margin. The portion of the lower lid opposite the coloboma was split into two layers and the inner tarso-conjunctival layers united by means of a continuous suture, brought out at each end to form a firm blepharorrhaphy (fig. 5).

b. The cutaneous layer can be provided in either of two ways. Sometimes the remaining skin of the lid can be rearranged to cover the defect. However, if there is insufficient skin to provide a satisfactory covering, a free graft of full-thickness skin from the opposite upper lid may be used, as illustrated (fig. 6). A double layer of perforated cilkloid was placed over the area and a pressure dressing applied. This was left in position for five days and changed at 5-day intervals for a total of three weeks.

*Second stage.* Two months later a lash transplant was done by dissecting down to the tarsus in the blepharorrhaphy and sewing in place a strip of hair-bearing

skin from the lower part of the nasal end of the eyebrow on the same side (fig. 7). A double layer of perforated cilkloid was applied and a pressure dressing changed at 5-day intervals for three weeks.

*Third stage.* In another 2½ months, when the hairs were seen to be growing, an incision was made between the two rows of lashes. Figures 8 and 9 show pre-operative and postoperative pictures, respectively, of a patient with carcinoma of the nasal end of the upper lid, in which this method was carried out. The growth involved the area around the medial canthus as well as the nasal one quarter of the lid. The nasal one third of the upper lid was removed.\*

#### B. TOTAL UPPER-LID RECONSTRUCTION

When total reconstruction of an upper lid is necessary, the problem is usually much more difficult, particularly because, as has been pointed out, movement of the lid must be provided as well as the replacement of the parts.

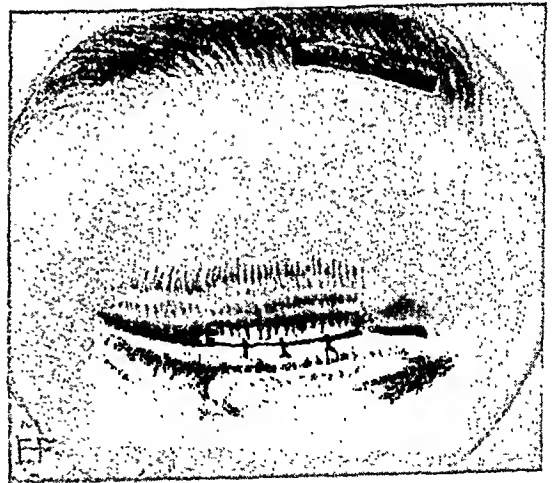


Fig. 7 (Hughes). Stage 2. Lash transplant. A strip of hair-bearing skin from the lower portion of the nasal end of the brow sewn in place in line with the lashes of the temporal portion of the lid.

\*I am indebted to Dr. Daniel B. Kirby for permission to report this case.

To provide the cutaneous layer a free graft of skin from the opposite upper lid may be necessary. In order that this graft may survive, the lower lid must be split and the tarso-conjunctiva drawn upward and its border united to what remains of the conjunctiva above the limbus. This serves to protect the cornea as well as to provide a vascular bed for the reception of the free graft of skin. Two months later the skin layer is dissected up, and a free graft of tarsus from the opposite upper lid is placed.<sup>11</sup>

If the opposing tarsus in the lower lid is sufficiently wide it may be used by reversing the method described for rebuilding a new lower lid. The drawn-up tarso-conjunctival layer may be sufficient to provide the inner layer for both upper and lower lids, so that no additional tarsus from the opposite upper lid will be necessary. Usually, however, the tarsus of the lower lid is too narrow and thin a struc-



Fig. 9 (Hughes). Postoperative result in patient operated on by the technique described for the condition shown in figure 8.

ture to provide a satisfactory tarsal plate for both lids. To provide tarsus for the new upper lid either tarsus or cartilage may be used as a free graft.

If the tarsus of the opposite upper lid is to be used it is removed with considerable conjunctiva attached to its upper border and is transplanted with its conjunctival surface toward the cornea. This provides a rigid plate to give proper form for the new upper lid. Two double-armed sutures are passed through from the conjunctival surface at the upper tarsal margin and brought out and tied externally to retain the upper fornix. At the same time or at a later date the tendon of the levator can frequently be isolated and brought down to be attached to the upper border and the anterior surface of the transplanted tarsus. Unless a satisfactory tarsal plate is provided, the upper lid usually appears too scanty and too highly arched, and the lids do not close properly during sleep, so that the cornea is more or less exposed.

Fig. 8 (Hughes). Case of carcinoma around the medial canthus extending through the nasal one quarter of the upper lid, necessitating removal of the nasal one third of the lid in its entire thickness.

Six or eight weeks later lashes may be supplied by transplanting a hair-bearing strip of skin from the lower part of the inner end of the brow on the same side.

These hairs usually provide a fairly good match for the hairs of the opposite upper lid. It is much more important and fortunately easier to provide cosmetically good lashes for the upper lid than for the lower.

When the lashes are seen to be growing well, usually after a period of another two or three months, the transverse incision to create a new lid fissure may be carried out.

### III. RECONSTRUCTION OF BOTH LIDS

When it becomes necessary to replace both upper and lower lids, such as in cases of severe burn with total necrosis, a serious problem confronts the surgeon. Of prime importance is the preservation of the eye, which consequently is frequently entirely unprotected. Usually there will be sufficient conjunctiva present to dissect up and bring the edges together from above and below to form primarily a protecting layer for the cornea over which may be placed a split-skin graft. The conjunctiva is, of course, reversed so that its epithelial surface is placed next the cornea. Because there is usually an extensive loss of skin in these cases, one can frequently not obtain sufficient normal lid skin for grafting purposes. In this type of case one must be content with a pair of lids that will not match the lids of the other eye in color. The split-skin graft from the arm or leg always remains whitish in color. If the skin is taken quite thin it usually, eventually becomes flexible. The tendon of the levator should be carefully preserved and attached to the conjunctiva as far down as is practicable, spreading it out as far as possible, and using fine buried sutures so as not to interfere with the healing of the graft.

If suitable tarsal tissue is available, it should be utilized for the inner layer. If not, a thin piece of cartilage from the ear

or rib should be inserted to provide some rigidity or body for the new lids. If this is done at the original operation a layer including the levator tendon should be brought down in front of the cartilage graft to separate it from the free split-skin graft and to provide nourishment for each of the free grafts (cartilage and skin). Otherwise the skin over this area would not receive nourishment and the corresponding portion would become necrotic. The cartilage must have some internal epithelial (not epidermal) covering, such as normal conjunctiva if available or mucous membrane from the mouth, if necessary. It is sometimes necessary to provide this by pregrafting a piece of buccal mucous membrane to the concavity of a portion of the ear cartilage. The ear cartilage with its adherent mucous membrane (representing the tarsus with its attached conjunctiva) is removed as a free graft after two or three weeks and inserted into the lid structure. The externally placed raw surface of the graft is covered with a layer of tissues which will provide nourishment.

In the case of total reconstruction of both upper and lower lids the blepharorrhaphy should remain intact for approximately one year (a minimum of nine months) before an interpalpebral fissure is made, in order to prevent subsequent contracture of the lids. If all bulbar conjunctiva as well as palpebral conjunctiva were destroyed, the eye would probably be so badly damaged as not to be worth saving. However, if it were thought that a useful eye could possibly be retained, thin grafts of mucous membrane from the mouth could be used to replace bulbar conjunctiva and further grafts could be placed into subcutaneous pockets nearby, which could later be used on the end of pedicle grafts to supply lids lined by this buccal mucous membrane.

## CONCLUSIONS

In each of the foregoing procedures it has been suggested that normal lid tissues be used to replace missing lid structures, whenever possible; when such tissues cannot be obtained, tissues should be supplied whose structure is as close to the original tissue as possible in regard to function, texture, color, thickness, and flexibility. In no case should epidermis be used for lining an upper lid where it may come directly in contact with the cornea, if the cornea of the eye is healthy, for it does

not provide a proper lining and may be the cause of complete loss of sight through corneal damage.

A second choice for lid tissues is: (a) For skin—split-skin graft, full-thickness skin from the cephalo-auricular angle as a free graft, or skin from nearby (rarely from chest or arm) used as a pedicle graft. (b) For conjunctiva—mucous membrane from the mouth or thin split skin when the vitality of the cornea is not a factor. (c) For tarsus—cartilage from ear or rib.

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# PENETRATING INJURIES OF THE EYE\*

## A STATISTICAL SURVEY

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During the five-year period from January 1, 1940, to December 31, 1944, a total of 691 patients with various types of injuries of the eyes and/or adnexa were hospitalized and cared for in the ophthalmologic department of the Cook County Hospital.

Of this number, 183 patients had penetrating injuries (including rupture) of the eyeball itself. The total number of eyes with such injuries was 185, since in two of the patients both eyes were injured on the same occasion. The present paper is concerned with a statistical survey of various facts, circumstances, and features encountered in this series of 185 consecutive and unselected penetrating eye injuries. While nothing essentially new is presented, it may be worth while, on occasion, to review some of our clinical experiences, if only in order to remind ourselves of some of the things we already know. We are not interested at this time in a review of the literature. The reader who so desires may make his own comparisons with other published reports.

It is desired to emphasize at the outset that this is a series of typically civilian and essentially nonindustrial injuries (there was only one industrial case). The male sex was represented by 144 patients, the female by 39, or approximately 79 percent of males. The incidence of cases in the various age groups showed that only 7 patients were past 60 years of age, and only 2 past 70, but revealed nothing else of any significance which would jus-

tify giving all the figures. No tabulation has been made on the basis of race or color, but we know that the proportion of Negroes (53.5 percent) was much larger than that in the population of the area served.

Out of the total of 185 eyes, 101 were lost, 42 by evisceration; the remaining 59 were enucleated (table 1). As shown in this table, a time element of seven days is introduced, during which early period af-

TABLE 1  
PENETRATING INJURIES

	A*	B†	Totals
Enucleations	20	39	59
Eviscerations	34	8	42
Number of eyes lost	54	47	101
Number of eyes saved			84
Total number of eyes in entire series			185

\* Within 7 days of injury.

† Later than 7 days after injury.

ter injury 34 of the 42 eviscerations were performed, but only 20 of the 59 enucleations. The statistics would only be complicated further by a breakdown into periods of one, two, or more days, and although the selection of the one-week period is arbitrary, the purpose will be evident. Naturally enough, most of the eviscerations were performed within one to three days of injury, and on hopelessly injured blind eyes, many with such large gaping scleral or corneoscleral wounds or ruptures that enucleation would have been difficult. Delay on the patient's part in giving consent, or delay in seeking medical care, were the reasons in the few cases in which evisceration was postponed more than a few days or a week; the

\* From The Department of Ophthalmology, Cook County Hospital, Chicago. Read before The Chicago Ophthalmological Society, March 19, 1945, as part of a symposium on eye injuries.

same considerations applied to enucleation in many cases. By those patients in whom the injury was hopeless and the eye blind or virtually so, enucleation or evisceration was finally refused when advised in six cases only. Conservative operations were performed on 25 eyes (table 3) which were later enucleated, this termination being almost invariably associated with undue prolongation of the primary inflammation. The other 34 enucleations were performed as the primary operation.

The location of the wound or rupture (table 2) was significant, especially in regard to the large number of purely scleral, and also of corneoscleral injuries, each group being approximately equal in number to that in which the wound was only corneal.

Conservative surgery on 87 eyes (table 3), or nearly half the total number in the series, was successful in saving 62 eyes, or well over two thirds of those operated upon. With exception of the three magnet operations, there were only six cases of this group in which a delay of more than two days occurred between injury and operation. The intervals were respectively 17, 12, 7, and 6 days, and in two cases, were 4 days. All of these eyes were saved; two recovered 1.0 vision, one 0.4; the other three patients were small children aged 1, 2, and 3 years, respectively. In most cases, operation was performed within 24 hours of injury, and in some within only a few hours. Of the 25 eyes enucleated after the failure of conservative surgery, it is probable that at least 12, or almost 50 percent, should have been enucleated primarily. There were only two eyes of this group of 25 which retained any considerable prospect of useful vision for more than a week or two after injury and operation. Only one case of sympathetic ophthalmia occurred in this group, although in the entire series the

total was two. It is possible that in some of the other 24 cases, sympathetic ophthalmia was prevented, a point which cannot be fully covered at this time, inasmuch as full pathologic reports on some of these eyes are not yet available. There

TABLE 2  
LOCATION OF WOUND (OR RUPTURE)

Site	No. of Eyes
Corneal	61
Corneoscleral	63
Scleral	59
Not stated	2
Total	185

TABLE 3  
RESULTS OF CONSERVATIVE SURGERY

Procedure	Eyes Lost	Eyes Saved	Totals
Conjunctival flap	22	58	80
With iridectomy	11	32	43
Without iridectomy	11	26	37
Scleral suture	1	3	4
Magnet operations	2	1	3
Totals	25	62	87

A total of 22 eyes which did not require operation recovered, with varying grades of visual acuity.

is one case, which we have not designated as sympathetic ophthalmia, in which paraffin sections of a small calotte showed lesions suggestive of sympathetic ophthalmia, but no positive diagnosis can be made yet, as the eye is in celloidin and not ready for sectioning. This eye had a corneoscleral wound caused by broken glass, and a conjunctival flap was done on the same day as the injury. The primary inflammation never subsided completely, and, about seven weeks after injury, enucleation was performed. This patient's uninjured eye has normal vision, and has not shown any evidence of inflammation during the entire period since the injury, a fact which has been confirmed within the past month by slitlamp

TABLE 4  
TYPE OF INJURY OR WOUND IN RELATION  
TO RESULT

Type of Wounds	Corneal	Corneoscleral	Scleral	Totals
Incised or lacerated wounds (direct injury)				
Eyes lost	18	23	20	61
Eyes saved	33	21	18	72
Totals	51	44	38	133
Rupture (contusion or blunt force)				
Eyes lost	6	13	21	40
Eyes saved	4	3	5	12
Totals	10	16	26	52

examination, some seven months after enucleation of the injured eye.

There were three magnet cases, in all of which the eye or the vision was eventually lost. In one case, the eye was enucleated shortly after failure to remove the foreign body. In another, although the foreign body was successfully removed, all that was saved was a blind eye. In the third case, in which the patient was first seen six months after injury, at which time the lens was completely opaque, the foreign body was removed with some difficulty by the scleral route. The eye became quiet, and an extracapsular lens extraction was done about six months after the magnet operation. For several months thereafter, the eye retained a corrected vision of 0.5, but later there were recurrent attacks of uveitis, secondary glaucoma, with finally loss of the remaining vision, and enucleation was performed almost three years after the original injury. This patient's remaining eye is, fortunately, normal.

The relative destructiveness of injuries in relation to the location of the external wound or rupture, shown in tables 4, 4 A, and 4 B, is in accord with previous knowl-

edge. For example, almost two thirds of the eyes with incised or lacerated wounds of the cornea were saved, as against the loss of more than half of those with similar types of wounds which were scleral or corneoscleral. The far greater destructive effect of severe contusion, with rupture of the tunica fibrosa, is strikingly shown. Less than 25 percent of those eyes with scleral or corneoscleral ruptures were saved, and of these 8 eyes, 5 were blind, 2 had vision of only 10/200, and the other, with a small scleral rupture, had 0.3. The 10 eyes with corneal ruptures fared somewhat better, only 4, or 40 percent, surviving, and 3 of these retained surprisingly good vision; namely, 0.4, 0.8, and 1.0, respectively. In many of

TABLE 4 A  
TYPES OF INJURY IN EYES LOST

Type of Wound	Corneal	Corneoscleral	Scleral	Totals
Incised or lacerated wounds (direct injury)	18	23	20	61
Rupture (contusion or blunt force)	6	13	21	40
Totals	24	36	41	101

TABLE 4 B  
TYPES OF INJURY IN EYES SAVED

Type of Wound	Corneal	Corneoscleral	Scleral	Totals
Incised or lacerated wounds (direct injury)	33	21	18	72
Rupture (contusion or blunt force)	4	3	5	12
Totals	37	24	23	84

these cases of severe contusion, especially, as will be shown later, those inflicted by a blow of the bare fist, or a fall, there is considerable evidence that the eyeball is ruptured by a true crushing injury, in the sense in which the term is used by the general surgeon, as when a hand or foot is crushed in a power press or beneath the wheels of a heavy truck or car. In these cases, the bulb is compressed between the striking object and the medial wall of the orbit, or its roof or superior medial angle.

Of injuries produced by sharp objects (table 5), more than two thirds were caused by glass fragments and knives. It is noteworthy that out of a total of 42 eyes injured by broken glass, 11 sustained penetrating wounds due to lens fragments

TABLE 5  
NATURE OF OBJECT CAUSING INJURY

Number of Eyes	Sharp Objects
42	Glass fragments (including spectacle lenses)
11	Spectacle lens fragments
24	Knife blades
3 each	Dart, ice pick, wood splinter, wood chip, steel chip (intraocular), scissors
2 each	Fishhook, razor
1 each	Can opener, hairpin, thorn, pin, staple, steel nail, twig
Number of Eyes	Blunt Objects (Contusion)
8	Falls (2 in bathtubs)
23	Blow of fist
3 each	Blows (unspecified), blackjack, wooden stick
2 each	Arrow, baseball, coat hanger, door-knob, iron pipe, stone
1 each	Ashtray, baseball bat, brick, gun stock, hook, post, rake handle, ruler, steel rod, toy, umbrella rib, walking cane
Number of Eyes	Other Categories
6	Gun shot injuries (bullets or BB shot, 3 intraocular)
9	Automobile accidents
4	Explosions
4	Unknown (in two cases, alcoholic intoxication)

TABLE 6  
RESULTS IN CERTAIN TYPES OF INJURY

Type of Injury	Total No. of Eyes	Eyes Lost	Eyes Saved	Eyes Saved but Vision Lost	Eyes Saved with Some Vision
Glass	42	15	27	6	21
Blow of fist	23	20	3	2	1
Falls	8	7	1	1	0
Gunshot	6	5	1	0	1
Motor car	9	4	5	2	3

from the patient's own spectacles. Blows with the bare fist caused a greater number (23) of ruptures of the eyeball than any other single type of blunt force, with falls ranking second. The extremely destructive nature of these injuries (table 6) is shown by the loss of 27 out of 31 eyes in the two groups combined, and the further fact that only 1 of the 4 eyes saved retained any vision. That is to say, in almost 97 percent of these cases, there was loss of the eye or of the vision, or both. Even in the six gunshot injuries, the one eye saved had some vision, although only 15/200. On the other hand, vision of various grades was retained by half of the eyes injured by glass, although about one third of these eyes were lost, and about 20 percent of those saved were blind.

Injuries to the lens or the zonule occurred in 56 eyes. There were 49 cases of traumatic cataract in which the zonule was not ruptured. In 7 eyes the zonule was ruptured, with subluxation or dislocation of the lens, and in 5 of these cases the lens was cataractous. In 43 cases the lens was injured by direct (penetrating) force, whereas contusion was responsible in the other 13 cases, including 6 of those with rupture of the zonule. The number of eyes lost was 27, or almost 50 percent of the total of this group, which is a little lower than the overall percentage (55 per-

cent). Of the 27 eyes lost, 14, or practically half, were removed (or eviscerated) very promptly, because of the severity of the injury. Three cases of endophthalmitis with lens injuries were identified clinically. Two of these eyes were lost, and the other remained blind. There may have been a few other cases of mild endophthalmitis which were masked by the lens opacity, and some of these may have recovered, as sulfonamides were given to 28 patients in this group.

There were two cases of sympathetic ophthalmia in the entire series, or slightly over 1 percent. Duke-Elder states that an average from the literature is 2 percent (of penetrating injuries). In both of our cases the injury was caused by glass. One was a boy four years of age, with a large transcorneal corneoscleral wound, in which a conjunctival flap with iridectomy was done on the day of the injury. An error of judgment was involved in the failure to enucleate the injured eye primarily, and, failing this, at some time within three weeks after the injury. Actually, this eye was not enucleated until five weeks after the injury, and four days after the onset of the uveal inflammation in the second eye. At the present time, the vision of this eye is reduced to 5/200 by old exudates and a degenerative keratitis.

The other case was "imported," and hence not chargeable to the service, inasmuch as the patient, a young man of 21 years, did not present himself until 10 weeks after the injury, for which operations had been performed in the interim at another hospital. The injured eye was promptly enucleated on our service, but this was (also) already four days after the onset of uveitis in the second eye. This patient was much more fortunate, however, in regard to the fellow eye, and recovered a visual acuity of 1.0.

In the entire series of 185 eyes, the visual acuity demonstrated on admission was better than serving only to count fingers at 5 feet in only 23 eyes (table 7 A). It may be significant that only 1 of these 23 eyes was lost, and the acuity of that eye on admission was no better than 0.1. It will be noted, on the other hand, that of 76 eyes with no light perception on admission, only 4 were saved, and only 2 of these regained any vision. More than half of the eyes with bare light perception were saved, and about 70 percent of those with vision sufficient only to perceive hand movements, as shown in table 7 A. Of eyes with acuity of better than perception of hand movements on admission, only two were lost (5/200 and 20/200) except for two small children whose visual acuity could not be tested and one in which the acuity was not recorded. Regarding the fact that 94 percent of the eyes which had no light perception on admission were lost, there may be some who will claim that the very fact that light perception was lost was the reason for the decision to enucleate or eviscerate the injured eye. This is certainly not correct. The decision to sacrifice the eye (or what was left of it) was based primarily on the severity of the injury, and the objective condition of the eye. Absence of light perception was merely inherent in this situation in the great majority of cases; to be exact, in 72 eyes out of 89, which latter figure represents the number of eyes with injuries so severe as to be practically hopeless.

There were 50 patients whose vision was better than 5/200 in the injured eye after recovery, and 34 of these had better than 0.1 vision (table 7 B). In addition to these, there were two small children, not included in the table of visual results (visual acuity on admission unknown) who have been reexamined in the past seven weeks. One was injured on August

8, 1941, at the age of four years and has recovered 0.6 with Jaeger 1 in the injured eye. The other was injured on January 16, 1942, at the age of two years, and now has 1.0 vision in the injured eye.

Table 8 gives a few figures on the employment of the sulfonamides; sulfathiazol in most cases. Of the 42 eyes lost in patients given sulfonamides there were 30 which were so severely injured that they would have been lost anyway. Those who wrote the therapeutic orders would appear to have leaned over backward in these 30 cases to give the patient the benefit of the doubt, or to put it another way, perhaps in these instances the drugs were just wasted. However, we may tentatively conclude that the remaining 12 of these eyes were lost possibly despite the use of sulfonamides. The table also shows that in the cases in which sulfonamides were not given, the 59 eyes lost were so severely injured that their loss was inevitable. In the group of 95 cases in which sulfonamides were given, 53 eyes were saved. To what extent these drugs contributed, in many of these cases, to this happy result it is difficult or impossible to say. However (and the table does not show this), there were only 5 eyes of the 53 in which there was definite clinical evidence to indicate that loss of the eye was actually prevented by sulfonamide therapy.

Among questions which may arise as to the validity of some of the statistics presented, there are three of sufficient consequence to warrant discussion here. First, are there cases in which the vision of the injured eye, as demonstrated on admission, represents a substantial underestimate of the actual vision, due, let us say, to the patient's psychologic or general physical condition? It is probably true that there were a few such cases, but the evidence suggests that the number was small, probably much less than 5 percent

of the total. Of 53 eyes saved in which the initial demonstrated acuity was no better than for counting fingers at 5 feet, there were only 12 with sufficient acuity for counting fingers up to 5 feet, 16 with perception of hand movements only, 21 with light perception only, and 4 with no

TABLE 7 A  
VISUAL ACUITY ON ADMISSION

Acuity	Eyes Lost	Eyes Saved
Nil	72	4
Light perception	18	21
Hand movements	6	16
Counting fingers (1' to 5')	1	12
10/200	0	6
10/200 to 20/200	1	9
20/100 to 20/20	0	7
Under 5 years (no acuity test)	2	8
Unrecorded	1	1
Totals	101	84

light perception (table 7 A). Any cases in which the initial vision was underestimated are probably in this group. Of 98 eyes lost, in which the acuity on admission was recorded, only 2 were demonstrated to have any better vision than perception of hand movements. Only 18 had even light perception, and 72 had no light perception (table 7 A). These findings square quite well with the fact that the 72 eyes with no light perception were among the 89 so severely injured and obviously hopeless, that they were enucleated or eviscerated as soon as possible. It is not very likely that the acuity of these eyes was underestimated except possibly in a few cases as to the presence or absence of light perception. The same applies more or less to the 12 cases in which enucleation was done later, after an ill-advised primary conservative operation based on a false optimism had been performed.

The second question has to do with the eventual fate of the 84 eyes reported as saved. It is known that at the time of dis-

charge or subsequently (see below) 2 of these eyes were totally blind, 10 had only light perception, 7 only perception of hand movements, and 18 others no better than 0.1 (table 7 B). What is the present condition of these eyes, and what of their

in the past seven weeks of 44 of the 183 patients, in 22 of whom the injured eye was saved, while in the other 22 it was lost. Parenthetically, it may be remarked that of the 22 patients who lost the injured eye, 19 have normal vision in the

TABLE 7 B  
VISUAL ACUITY§ AFTER RECOVERY

A*	B†	C‡	Visual Acuity Improved to											Unrecorded
			$\frac{10}{200}$	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0	1.2	1.5	
Nil	4	2	1				1							
L. P.	21	10	5	1	1		1		1					2
H. M.	16	7	1		1	1	1		1	2				2
C. F. (to 5')	12	3	1		1	2		1	1	2	1			
10/200	6	2			2					2				
10/200 to 0.1	9	2		2				1			3	1		
0.2 to 1.0	7								1	1	4		1	
Totals	75	26	8	3	5	3	3	2	4	7	8	1	1	4

\* Visual acuity on admission.

† Number of cases.

‡ Number of cases (with less than 0.1) not improved.

§ Corrected vision.

future? Have any been enucleated without our knowledge?

The third question is simply an extension of the second, and has to do with the accuracy as of the present date and the future, of the acuities of the recovered eyes, as shown in table 7 B.

A partial answer to questions two and three is afforded by a reexamination with-

TABLE 8  
SULFONAMIDE THERAPY

	A*	B†	Totals
Eyes saved	53	31	84
Eyes lost	42	59	101
Eyes lost inevitably	30	59	89
Totals	95	90	185

\* Sulfonamides given (95 cases).

† Sulfonamides withheld (90 cases).

remaining eye, one has 0.6, and another, with bilateral injury, has only light perception in the remaining (injured) eye, but with some prospect of improvement to follow extraction of the cataractous lens. The other is the tragic case of sympathetic ophthalmia previously referred to, in which the acuity of the remaining eye is only 5/200. Of the 22 eyes which were saved, there is one blind eye which should be enucleated, but which has not yet been transferred to the lost column, as the enucleation has not yet been done. If this proportion holds good for the 76 per cent of saved eyes not reexamined very recently, there may be 4 eyes reported as saved which should be enucleated, making a total of 105 instead of 101 eyes lost, and 80 instead of 84 eyes saved.

In this recent reëxamination of 22 patients whose eyes were saved, there were in more than half the cases, some differences, in most cases slight, in the acuity of the injured eye as compared with that on discharge from the hospital. These changes were about equally divided between improvement and impairment. The acuities shown in table 7 B represent in each instance the most recent finding. Since traumatic cataract was present in 22 of the 84 eyes saved, there is the possibility that further improvement of vision may be secured in some of these eyes by operation.

#### SUMMARY AND CONCLUSIONS

To summarize only the most salient points brought out by these statistics:

1. Corneal, scleral, and corneoscleral injuries occurred in about equal proportions.

2. Of the incised or lacerated wounds, about two thirds of those purely corneal were saved; of the scleral and corneoscleral, less than half.

3. Of the corneal, scleral, and corneoscleral ruptures due to contusion, only 40 percent of the corneal were saved, and less than 20 percent of the others.

4. Injuries due to a fall or the blow of the bare fist were almost uniformly totally destructive of the vision and even of the eye.

5. Broken glass caused 22.7 percent of all the injuries in this series, and in 50 percent of these, the eye or the vision was completely lost. There was partial loss of vision in most of the remainder.

6. Seventy-one percent of the 87 eyes upon which conservative surgery was performed were saved. Although in 6 cases operation was delayed from 4 to 17 days, not one of these eyes was lost.

7. Only one eye with demonstrated acuity on admission of as good as 0.1 was lost. Of the other eyes lost, no better

acuity than perception of hand movements was demonstrated on admission in 99 percent; there was no light perception in about 75 percent. Of 76 eyes with no light perception on admission, only 4 were saved, and only 2 of these recovered any vision.

8. While the value of the sulfonamides in certain cases cannot be questioned, there were but few cases in this series in which their dramatic effect could be demonstrated.

From the statistics presented, we feel justified in drawing two practical conclusions, both of which are important and worthy of emphasis, although not new. The first has to do with prevention. According to our statistics, more than one fifth of penetrating injuries of the eye would be prevented, or at least minimized, by the elimination of glass, as we now know it, from our domestic economy. Let us hope that the time may be close at hand when glass in its present form will be universally displaced by transparent plastics and new forms of unbreakable glass.

The other conclusion applies to a smaller group of cases, and has to do with overoptimism or attempted conservatism in dealing with penetrating injuries of a severe type, particularly those in which the wound is corneoscleral. There were 12 such cases, or about 6 percent, in this series, in which, through mistaken judgment, conservative surgery was performed instead of prompt enucleation. In such cases as these, the beginner in ophthalmology may reduce the risk to the patient, even though several hours' postponement of operation be entailed, by calling a consultant with sound clinical judgment.

As a last word, it may be worthwhile to rephrase and repeat an old dictum, designed to prevent sympathetic ophthalmia, as well as various other lesser evils,



to the effect that, in the absence of any cogent reason to the contrary, any eye with a penetrating wound should be enucleated within three weeks after injury,

unless the posttraumatic inflammation has subsided or is well on its way to subsidence.

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## RELATIONSHIP BETWEEN VISUAL ACUITY AND REFRACTIVE ERROR IN MYOPIA

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### INTRODUCTION

The purpose of this paper is to present quantitative data showing the relationship between visual acuity and refractive error in the various types of myopia; namely, simple myopia, simple myopic astigmatism, and compound myopic astigmatism.

Visual acuity plays an important part in determining the medical fitness of a candidate for aircrew duties in the R.C.A.F. Since it is known that the results of a visual-acuity test may fluctuate considerably from day to day, it is often difficult to decide upon the acceptance or rejection of a candidate with visual acuity that borders on the minimum standard. On the other hand, clinical observation has led to the belief that refractive error determined under cycloplegia will remain fairly constant over a short period of time at least. It was considered, then, that auxiliary visual standards, stated in terms of refractive error, would permit more ac-

curate selection in cases with "borderline" visual acuity.

A review of the available literature revealed only one study (Kempf, Collins, and Jarman<sup>1</sup>) in which quantitative data for the relationship between visual acuity and refractive error in myopia were presented. Unfortunately, this investigation was carried out with children, of whom only 123 out of 1,860 were myopic, and the authors made no attempt to segregate the various types of myopia. The present study contains the results obtained by comparing the refractive errors and visual acuities of 909 R.C.A.F. personnel.

### METHODS

The data were obtained from an analysis of the refraction records accumulated at two R.C.A.F. medical boards. Most of the examinations had been carried out by four ophthalmologists.

*Subjects.* There were 909 subjects; 885 male and 24 female. The mean age

TABLE 1  
NUMBER OF SUBJECTS AND MYOPIC EYES AND MEAN AGE OF MYOPIA GROUPS

Myopia group	No. Subjects	No. Eyes (cases)	Mean Age
Simple myopia	266	325	24.4 years
Simple myopic astigmatism	138	160	24.7 years
Compound myopic astigmatism	505	714	23.6 years
Total	909	1199	23.9 years

of the group was 23.9 years, most of the subjects being between 18 and 32 years of age. Only 6.5 percent were 33 or older at the time of examination. For the purposes of this study, it was decided to consider every myopic eye examined as an

was observed. The findings used in this study were obtained before cyclopentolate was administered. The cyclopentolate was a 2-percent solution of homatropine hydrobromide given as follows: two drops, the child at least 40 minutes before the start

TABLE 2  
STUDY GROUP  
RELATIONSHIP BETWEEN VISUAL ACTIVITY AND REFRACTIVE ERROR

R.E. in Diopters	Visual Acuity Fraction and International Rating											Total Percent
	20/20	20/30	20/40	20/50	20/60	20/70	20/80	20/90	20/100	20/120	20/150	
	100.0	66.7	50.0	40.0	33.3	28.6	25.0	20.0	16.7	10.0	5.0	
-0.25	30	9										15
-0.50	9	19	31	14	5							78
-0.75	1	7	41	39	15	2	2					92
-1.00		1	3	18	42	1						65
-1.25			1	6	8	1	1			1		28
-1.50				1	2	2	1	5	1	1		15
-1.75					1	1	1	1	1	1		7
-2.00							1			2		3
-2.25						1	1				2	4
-2.50										3		3
-2.75								2		4		6
-3.00											4	4
-3.25											1	1
-3.50											1	1
-3.75												0
-4.00										5		5
-4.25										1	2	3
or more												
Total	40	36	76	69	41	11	6	7	19	12		325
Mean R.E.	-0.32	-0.50	-0.66	-0.82	-0.97	-1.39	-1.33	-1.87	-2.08	-3.56		-0.724

1 Mean visual-acuity rating of the total group.

2 Mean refractive error of the total group.

individual case. For this reason the number of "cases" presented in the text below exceeds the number of subjects. Table 1 shows the number of subjects, the number of myopic eyes, and the mean age of each myopia group.

**Procedures.** The visual acuity was determined by means of the Snellen test carried out with an American Optical Company Project-O-Chart in a 20-ft. dark tunnel. In the testing of visual acuity an attempt was made to eliminate the effect of squinting by raising the upper eyelid digitally whenever squinting

of the refraction, followed by one drop 15 minutes after the first instillation.

**Treatment of data.** For statistical purposes, the visual-acuity fraction was converted into a percentage (for example, 20/30 = 66.7 percent). This percentage represents the international visual-acuity rating. The rating does not correspond to the actual percentage of vision,<sup>2</sup> but mathematical calculations can be made more readily when visual acuity is expressed in these terms. Kempf, Collins, and Jarman<sup>3</sup> treated their visual-acuity results in a similar manner. The mean

TABLE 3  
SIMPLE MYOPIC ASTIGMATISM  
RELATIONSHIP BETWEEN VISUAL ACUITY AND REFRACTIVE ERROR (CYLINDERS)

R.E. in Diopters	Visual-Acuity Fraction and Rating								Total	Mean V.-A. Rating %
	20/20	20/30	20/40	20/50	20/60	20/70	20/80	20/100		
	100.0	66.7	50.0	40.0	33.3	28.6	25.0	20.0		
— .25	30	1		1					32	97.0
— .50	9	13	12	2	1				37	67.0
— .75	1	12	12	3	1				29	57.0
—1.00		3	13	3	5				24	47.4
—1.25	1	1	9	8	1	3			23	45.9
—1.50			2	1		2		1	6	37.8
—1.75				4					4	
—2.00			2					2	4	34.7
—2.25					1				1	
Total	41	30	50	22	9	5	0	3	160	62.4†
Mean R.E.	— .34	— .67	— .90	—1.14	—1.08	—1.35	—	—1.83	— .795†	

TABLE 4  
COMPOUND MYOPIC ASTIGMATISM  
RELATIONSHIP BETWEEN VISUAL ACUITY AND LARGER CYLINDER

R.E. in Diopters	Visual-Acuity Fraction and Rating										Total	Mean V.-A. Rating %
	20/20	20/30	20/40	20/50	20/60	20/70	20/80	20/100	20/200	20/400		
	100.0	66.7	50.0	40.0	33.3	28.6	25.0	20.0	10.0	5.0—		
— .50	26	25	14	3							68	74.6
— .75	19	35	51	24	10	2					141	57.7
—1.00	3	24	63	34	31	3	1	2	1		162	46.4
—1.25	2	5	41	25	31	9	5	1			119	42.2
—1.50		4	10	18	17	8	1	6	7		71	35.2
—1.75		1	2	6	7	5	4	3	4		32	30.7
—2.00				2	4	3	3	3	5	1	21	18.6
—2.25						2	1	1	9	4	17	
—2.50						3		2	3	7	15	16.4
—2.75				2	3	1	2			4	12	
—3.00					2	1		1	1	9	14	13.8
—3.25					3				1	3	7	
—3.50						2	1	1	1	6	11	11.2
—3.75									1	1	2	
—4.00										6	6	5.5
—4.25 or more								1	1	14	16	
Total	50	94	181	114	108	39	18	21	34	55	714	43.9†
Mean R.E.	— .66	— .82	— .98	—1.16	—1.36	—1.72	—1.83	—2.00	—2.18	—3.42	—1.36†	

† Mean visual-acuity rating of the total group.

† Mean refractive error of the total group.

visual-acuity ratings obtained by averaging the percentages may be converted into the conventional visual-acuity fractions with a numerator of 20. In compound

myopic astigmatism the larger cylinder was in all cases treated as the refractive error. Preliminary calculations showed that the larger and smaller cylinders tend

to vary together in size, so that little is gained by also considering the smaller

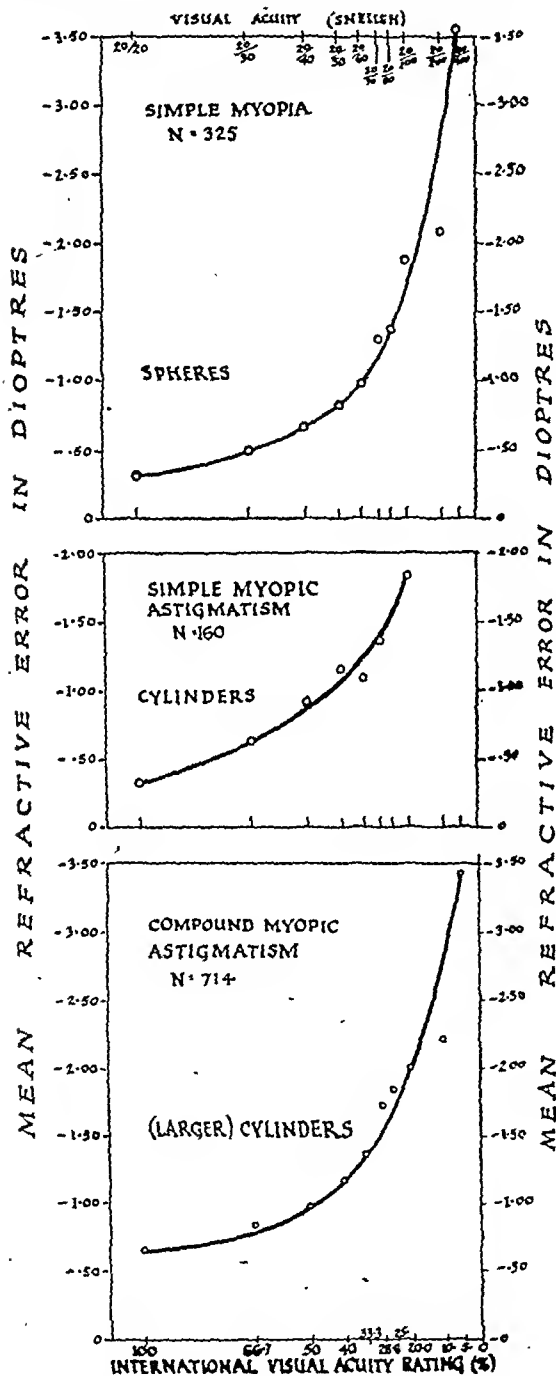


Fig. 1 (Crawford *et al*). Mean visual acuities for specified diopeters of different types of myopia. Individual graphs give type of myopia, type of corrective lens, and number of cases (N). Open circles represent actual mean international visual-acuity ratings. Smooth curves were fitted by inspection. Graphs derived from data in tables 2, 3, and 4.

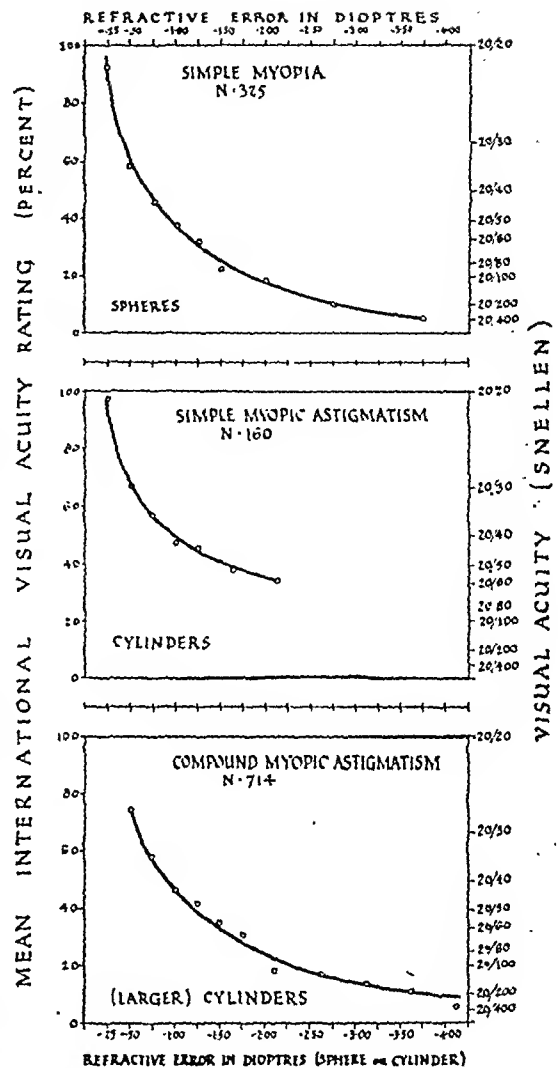


Fig. 2 (Crawford *et al*). Mean diopeters of different types of myopia for specified visual acuities. Individual graphs give type of myopia, type of corrective lens, and number of cases (N). Open circles represent actual mean refractive errors. Smooth curves were fitted by inspection. Graphs derived from data in tables 2, 3, and 4.

cylinder. (The linear correlation between the larger and smaller cylinders was .812.)

## RESULTS

The distributions of cases obtained by comparing visual acuity and refractive error in 325 cases of simple myopia, 160 cases of simple myopic astigmatism, and 714 cases of compound myopic astigmatism are given in tables 2, 3, and 4, re-

spectively. Also shown in these tables are the mean refractive errors corresponding to each visual acuity and the mean international visual-acuity ratings for those ranges of refractive error in which it was considered that there were sufficient numbers of cases to justify the calculation of a mean. The mean visual-acuity ratings for specified diopters of refractive error are graphed in figure 1, and the mean refractive errors corresponding to each visual acuity are plotted in figure 2 for each of the three types of myopia.

dex of .775 reported by Kempf, Collins, and Jarman<sup>1</sup> for all types of myopia in children.

The smooth curves in figures 1 and 2 were drawn by inspection. They closely approximate the actual means represented by the open circles and are a further indication that a lawful relationship exists between visual acuity and refractive error in myopia. It should be emphasized, however, that the curves in figures 1 and 2 serve only to describe the present data and do not necessarily portray the true

TABLE 5  
CORRELATION RATIOS (ETA) FOR RELATIONSHIP BETWEEN VISUAL ACUITY AND REFRACTIVE ERROR IN SIMPLE MYOPIA, SIMPLE MYOPIC ASTIGMATISM, AND COMPOUND MYOPIC ASTIGMATISM

Type of Myopia	Prediction of V.-A. from R.E.		Prediction of R.E. from V.-A.	
	Eta	Probable Error	Eta	Probable Error
Simple myopia	.834	.011	.888	.008
Simple myopic astigmatism	.792	.020	.705	.028
Compound myopic astigmatism	.764	.011	.829	.008

It is clear from the data that, in simple myopia, simple myopic astigmatism, and compound myopic astigmatism, an increase in refractive error is generally accompanied by a reduction in the visual acuity. An indication of the strength of association between visual acuity and refractive error in the different types of myopia may be obtained from the correlation ratios\* presented in table 5.

All of the correlation ratios show that these two variables are strongly correlated, with, perhaps, a stronger relationship in simple myopia than in the other types. The statistical constants obtained for the variation in visual-acuity rating with change in refractive error (.834, .792, .764) agree well with the correlation in-

mathematical relationship between visual acuity and refractive error in the different types of myopia. The shape of the curves is conditioned by the percentage method of expressing visual acuity, and the points involving visual acuities of 20/200 or worse are probably inaccurate because the ordinary Snellen test is very crudely graded above 20/100, with only one test letter for 20/200, 20/300, and 20/400 vision. Up to 20/100 vision, the data presented in figures 1 and 2 probably do give a close approximation to the true relationship between the international visual-acuity rating and refractive error in simple myopia, simple myopic astigmatism, and compound myopic astigmatism.

\* The correlation ratio, symbolized by the Greek letter, eta, is a statistical constant which indicates the strength of the connection between two variables and which is used when the relationship is curvilinear. (A correlation coefficient is used for a linear relationship.) The correlation ratio may vary from zero to 1.00. A ratio of 1.00 indicates a perfect association between two variables while a zero ratio indicates the absence of any relationship (Guilford,<sup>2</sup> pp. 343-349).

Tables 2, 3, and 4 show that for a given visual acuity there is usually to be found a relatively wide range of refractive errors and correspondingly for a given refractive error there will be a wide range of visual acuities. This result would, of course, have been anticipated from the observed day-to-day variation in visual-acuity measurements which gave rise to this study. Thus, although the average visual acuity in a series of individuals with a given refractive error in a specified type of myopia may probably be predicted with considerable accuracy from the present data, a similar prediction for any individual person cannot be made.

#### DISCUSSION

Quantitative data have been presented to show that there is a close relationship between visual acuity and refractive error in simple myopia, simple myopic astigmatism, and compound myopic astigmatism; generally the refractive error becomes greater as the vision becomes poorer. The association between these two variables is, however, not a perfect one, and it is not to be expected that accurate prediction of visual acuity from refractive error (or conversely) can be made for any single individual. It would appear that factors other than the refractive error influence the performance of myopic individuals in a Snellen test.

Although individual predictions cannot be made from the data in this study, the results may be used to determine the visual acuity which would be most likely

to correspond to a given refractive error in a series of cases. If the visual standards for a given type of employment required the attainment of a given Snellen reading, an auxiliary standard in terms of refractive error could also be stated. For example, if the visual-acuity standard were 20/50, it could also be stipulated that the refractive error should not exceed  $-1.00D$ . in simple myopia (see table 2 and upper section of figures).

#### SUMMARY AND CONCLUSIONS

1. Data showing the quantitative relationship between refractive error and visual acuity were presented for 325 eyes with simple myopia, 160 eyes with simple myopic astigmatism, and 714 eyes with compound myopic astigmatism.

2. The results showed that visual acuity and refractive error are closely correlated, although factors other than refractive error influence visual-acuity measurements.

3. The data presented here permit for myopia the construction, in terms of refractive error, of visual standards which may be used to supplement the usual statement of such standards in terms of Snellen test findings.

The writers wish to acknowledge their gratitude for the advice and criticism of Wing Commanders J.V.V. Nicholls and K. E. Evelyn, Squadron Leader J. F. Minnes, and Flight Lieutenant L. S. S. Kirschberg.

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# RESECTION OF THE INFERIOR OBLIQUE MUSCLE IN HYPOTROPIA\*

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Resection of the inferior oblique at its insertion offers a practical and effective means of correcting hypotropia due to paresis or paralysis of this muscle. Only one report of this procedure appears in the literature.<sup>1</sup> To those familiar with the surgical anatomy of this area the operation may well be found readily acceptable. Poor surgery, however, may result in a haggled procedure, the functional end result of which may even be that of a tenotomy. This would simply further weaken an already paretic muscle and cause a more pronounced dropping of the eye. On the other hand, a clean, anatomic dissection and exposure of the various structures as they are encountered, coupled with a neat resection and securely anchored sutures, is a gratifying procedure which appears to give positive results and on the whole is not difficult of attainment.

## BACKGROUND IS RECENT

Shortening of the inferior oblique was first reported in 1935 by Wheeler<sup>2</sup> who approached the muscle through a skin incision over the orbital margin. The muscle was severed from its bony attachment, pulled over the orbital margin, and attached to the periosteum. Wheeler observed that his results had been "disappointing in some instances" but "rather easy of performance." White<sup>3,4</sup> suggested either advancement or tucking of the inferior oblique near its insertion through a conjunctival incision just below the external rectus, or a tuck made and advanced similarly to that described by Wheeler<sup>2</sup> for advancement of the supe-

rior oblique. However, White<sup>5</sup> found that when operative attack was confined to the paralytic inferior oblique alone negligible results were obtained.

Chavasse<sup>6</sup> was of the opinion that because the periosteum at the orbital margin was so thin there would be some difficulty in securely anchoring a resected muscle stump to it, as described by Wheeler. He suggested tunnelling of the lower orbital margin in the direction of the nasal cartilages, passing of the muscle through the tunnel, and then emerging through a second skin incision where the suture was tied over a piece of wool. Chavasse claimed that the amount of pull of the paretic oblique could be regulated in accordance with the requirements of the case at the time the suture was tied. No cases were reported. This procedure is largely an extraorbital one which, no doubt, few ophthalmic surgeons would care to undertake, as the probability of injury to the lacrimal apparatus is ever present and the danger of poor healing of two skin incisions very real. Furthermore, if the procedure of resection of the inferior oblique is to assume its rightful place in ophthalmic surgery it is highly desirable that the operative field be confined to the orbit.

The work of Hughes and Bogart<sup>7</sup> and of Hughes<sup>8</sup> on the correction of hypotropia by recession of the trochlea appears to be closely related to the problem at hand. These authors reported their experiences with recession of the trochlea in eight cases of overaction of the superior oblique muscle. The overaction was considered by them to be due to paresis or paralysis of the contralateral associate, the inferior rectus. However, they stated that in sev-

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eral of their cases the action of this muscle appeared in no wise deficient. In two cases it was definitely paretic. On the other hand, weakness of the inferior oblique, the direct antagonist, was noted in several instances. It seems reasonable to assume, therefore, that in some of their cases recession of the trochlea was performed for paresis of the inferior oblique muscle. Whether the paresis was primary or whether it was secondary to an overactive superior oblique cannot be stated categorically. Here again, the recession operation is a highly specialized one, involving several complications, including possible intracranial injury. Furthermore, it appears that simple resection of a paretic inferior oblique not only results in its strengthening but also in the elimination of overaction of the superior oblique.

Resection of the inferior oblique at its insertion was first performed by Berens and Loutfallah<sup>1</sup> in 1943, in a case of postoperative hypotropia wherein the same muscle, several years previously, had been tenotomized at its origin. An elevation in the hypotropic globe of 4<sup>A</sup> in the primary position and 10<sup>A</sup> in the field of action was obtained from a 7.0-mm. resection at its insertion. A single mattress suture of nylon was taken behind the previously applied muscle clamp and then carried into the episclera at the site of the original insertion. My procedure differs somewhat from the foregoing in that the clamped muscle was first severed from its insertion, the nature of which was thoroughly inspected, and a mattress suture of 4-0 chromic catgut on two atraumatic needles was taken first through the substance of the stump and then carried into the muscle, much as described by Lancaster<sup>9</sup> for resection of the horizontal recti. Because the insertion of the inferior oblique is rather wide, additional sutures were taken anterior and posterior to the central one, as illustrated in figure

3. This insured firm anchoring of the muscle to the sclera and lessened the likelihood of slipping. The external rectus was detached beforehand, a desirable routine in any event, inasmuch as a resection of this muscle was contemplated at the same sitting. It is obvious that this procedure differs little if at all from most present-day resection operations in which the sutures are buried and is therefore a strong argument for more of this type of surgery when it is indicated. A resection operation avoids the lumping effect frequently obtained with tucking of the muscle and appears to be a sounder surgical attack.

#### IMPORTANCE OF SURGERY FOR VERTICAL DEVIATIONS

It will be seen from the foregoing that resection of the inferior oblique muscle is not necessarily difficult. I have a similar attitude toward other types of surgery on the obliques and on the vertically acting recti; namely, the superior and inferior rectus muscles. The latter, of course, presents no unusual problems. This attitude has its basis in the fact that surgery of the vertical deviations has been sorely neglected and the need for it always has been great. I feel that the time is near at hand when the ophthalmic surgeon will not limit himself to standard procedures on the horizontal recti but will also look for and attack a coexisting vertical deviation if present. This indeed is very frequently the true underlying imbalance, the horizontal deviation actually being a secondary phenomenon.

Surgery of the vertically acting muscles must have its basis in a thorough "muscle work-up" and a correct diagnosis. The majority of horizontal deviations will be found to have a vertical component; most of these require surgery. If a vertical imbalance is recognized, surgery on the horizontal recti alone is not well



advised unless for some specific reason\* this is desirable. In general, a vertical deviation of more than 15<sup>Δ</sup> is preferably attacked as a primary procedure or at least together with the surgery of the internal or external rectus or both, as the case may require.

Surgery of the vertically acting muscles has been increasing in significance from year to year, particularly so since orthoptics has gained in popularity. No less important is the fact that the ophthalmic surgeon's goal is increasingly that of a good functional result rather than a satisfactory cosmetic one. In the postwar era it is very likely that more attention will be paid to the preventive aspects of ophthalmology, and we may expect our patients to reach us long before suppression, amblyopia, and secondary correspondences have become well established. In this event restoring the binocular status will indeed demand more than just a routine operation on the internus or externus, or both.

The reader will gather that a paralytic factor underlies a vertical imbalance. Indeed, the majority of squints are due to a paralysis of one or more muscles, although the presence of an accommodative factor in many cases contributes to the horizontal deviation. Not commonly appreciated is the fact that paralytic squints of long standing frequently become concomitant, making a differential diagnosis difficult. The incidence of heterotropia due to a pure convergence excess or insufficiency, or divergence excess or insufficiency is indeed small. Since paralyses are the result of hereditary influences and disease or injury occurring in the prenatal, natal, or postnatal periods, our surgical problems will be largely found in young children. If a diagnosis can be made and surgery is indicated, no patient beyond the age of 18 months should be denied it. This fact is not recognized by

a large section of the medical profession in general.

#### PROPER WORK-UP OF EVERY SQUINT IS OF THE GREATEST IMPORTANCE

A muscle work-up to be adequate must include a careful inquiry into the onset and course of the squint, its relation to trauma, disease, and psychologic factors. The history of squint in siblings, parents, and grandparents is significant, as many have a familial etiology.

*General ocular examination.* Routine ocular examination is important and not infrequently passed over superficially. Diseases of the cornea, lens, vitreous, and the fundus, interfering with the formation of a proper retinal image as they do, are contributing factors in the production of squint. A rough appraisal of the ocular motility at this time is occasionally revealing, and a careful visual-acuity test with and without glasses is extremely important. The next step should include a refraction under full cycloplegia and the proper prescription for spectacles.

*Brief orthoptic investigation.* A brief diagnostic orthoptic work-up is of inestimable value, as may also be some pre-operative orthoptic training. Generally, the determination of elementary fusional capacity by the Worth four-dot test is of importance. Further investigation should include the search for the presence and degree of suppression, secondary correspondences, measurement of the "subjective" and "objective" angles, all conveniently done on the synoptophore. The presence or absence of fusion at the angle of squint, if the vision is not too poor, may also be investigated on the synoptophore and is of value with respect to future capacity for fusional training.

The scrutiny of ocular motility and the measurement of the angle of squint are the highlights of the ocular investigation, and the most fascinating. These proce-

dures provide a background of clinical data, both gross and mathematical, by which one may be guided with respect to the kind and amount of surgery required, and without which one's attack becomes a hit-or-miss procedure and accounts for many failures.

*Screen comitance test.* Ocular motility is best investigated by the screen comitance test, as described by White,<sup>10</sup> one eye then the other being used in the fixation process. In this manner both primary and secondary deviations may be elicited and evaluated.

*Near point of convergence.* The measurement of the convergence near point in millimeters (PCB or NPC) is an extremely important guide to the amount and type of surgery indicated on the horizontal recti. The contributing effect on the convergence of the vertically acting recti and the obliques, when surgery on these is contemplated, must also be considered. A careful notation should be made of the distance in millimeters at which convergence is disrupted and of the eye that deviates first.

*Measurement with prisms.* The actual measurement of the angle of squint is best performed with square prisms and the screen test. The fixating eye is ascertained and the prisms are best placed before the squinting or less-dominant eye, as in the alternating type of squint. Measurements are made for distance (20 feet) and for near (13 inches), first with correcting spectacles, then without. One then proceeds to measure the angle of squint without correction in the six diagnostic positions of gaze.

*Hirschberg test.* If the amblyopic eye is unable to fixate a source of light, the Hirschberg test gives one an approximate measurement of the angle of squint in the primary position. In this test the patient is asked to fixate an object at infinity while a small source of light is held be-

fore the eyes at 13 inches; the position of the reflex on the cornea of the tropic eye is compared with that on the fixating eye and each millimeter of displacement from the center of the apparent pupil is noted. A displacement of 1.0 mm. is approximately equal to  $7^\circ$  of arc or  $14^\Delta$ . The test is repeated with fixation of the light at 13 inches. The test may be repeated with glasses and the existence of an accommodative factor evaluated.

Having gained both a mathematical and dynamic appraisal of the problem before him, and having arrived at a diagnosis, the ophthalmic surgeon is prepared to carry out the necessary procedures on a logical basis.

#### REPORT OF A CASE

This case illustrates the effectiveness of resection of a paralytic inferior oblique muscle in a patient with double elevator paresis of the left eye. It is one in which the paralysis was so marked that elevation of the globe to the median horizontal plane in the nasal field was not possible. It is also one in which a high degree of secondary contracture of the ipsilateral superior oblique was present. There was moderate weakness of the superior rectus in the same eye, with the result that there was limitation of elevation of the globe in abduction as well.

M. M., a girl, now aged seven years, was first seen in the Ophthalmic Clinic of the Boston City Hospital in November, 1940. The complaint presented by the mother at that time was turning in of the left eye following a seizure of whooping cough one year previously. The child was recorded as having an "in and downward" turn of the left eye. The refraction was estimated under atropine cycloplegia and +1.50D. spheres were prescribed. A diagnosis of paralysis of the inferior oblique and superior rectus muscles of the left eye was made, but surgery was not contem-

plated. A year later, at age  $3\frac{1}{2}$  years, it was noted by another examiner that there was "difficulty" in elevation in adduction and "weakness" in elevation in abduction, that the right eye was the fixating eye, and that the angle of squint was 35 to 45 arc degrees. The following year a surgical approach to the problem was considered,

seizure of whooping cough about one year later it remained permanently esotropic. The mother denied more than periodic esotropia before that time.

Inquiry into the prenatal, natal, and postnatal periods was unrevealing. Except for a moderately severe attack of pertussis at the age of  $1\frac{1}{2}$  years, the pa-



Fig. 1 (Wagman). The patient eight months prior to surgery. Right eye fixating. Left esotropia pronounced. Left hypotropia is particularly striking in that line of fixation of right eye is directed slightly upward. Note head tilt to right.



Fig. 2 (Wagman). The patient two months after surgery of the left eye. Internus receded 4.5 mm., inferior oblique resected 6.0 mm., and externus resected 10.0 mm. in one-stage operation. Horizontal alignment faultless. A left hypertropia of  $3\Delta$  present in the primary position at 13 inches. Head tilt markedly improved.

but no definite steps were taken. Several refractions were done under cycloplegia, and the prescription varied somewhat each time, the latest one being: O.D. +2.50D. sph.  $\approx$  +0.50D. cyl. ax.  $90^\circ$ ; O.S. +2.50D. sph.  $\approx$  +0.75D. cyl. ax.  $90^\circ$ . Occlusion of the right eye was practiced from time to time.

I first saw this patient in August, 1944. Careful inquiry into the history revealed that the left eye "began" to turn in at the age of nine months and that after the

tient experienced no further significant systemic diseases.

*Ocular examination.* The lids were entirely normal except, perhaps, for a suggestive ptosis of the left eye, which appeared to be no more than one would expect in a hypotropic eye, which, of course, is followed to some extent by its upper lid. This is properly a pseudoptosis. There was a moderate asymmetrical epicanthus, more marked on the left, im-

parting the appearance of even greater esotropia. The head tilt to the right was pronounced, and the face was usually turned noticeably downward. The globes were anatomically normal, the corneas clear, the pupillary dynamics active, the media and fundal expanses in no wise remarkable.

*Muscle balance* Gross inspection revealed that fixation was with the right eye and that the left eye was markedly esotropic and obviously hypotropic (fig. 1). The cover test disclosed little effort on the part of the left eye to take up and hold fixation. Inasmuch as paralyses and secondary contractures were so well established and the deviations so great, measurement with prisms and the screen test was deemed impractical and reliance was placed on the screen comitance and the Hirschberg tests. With the right eye fixating, the screen comitance test revealed marked limitation of elevation in the field of the left inferior oblique, and on depression, marked contracture of the left superior oblique. In eyes left and up, the left eye fixating, limited elevation was observed in the field of the left superior rectus, with a patent overshoot of the right inferior oblique, its contralateral associate. In eyes left, there was marked deficiency of abduction of the left eye, with secondary deviation of the right internus. In eyes right, secondary contracture of the left internus was very evident in that the cornea of the left eye practically disappeared behind the inner canthus. The Hirschberg test disclosed over 60° of esotropia and 15 to 25° of hypotropia, for both distance and near. With spectacles there was suggestive lessening of the horizontal deviation, indicating the presence of an accommodative factor. The findings of the screen comitance test preoperatively are set forth in figure 4, the number of plus marks indicating the de-

gree of deviation, in as much as measurement with prisms was impractical, as previously stated.

*Visual acuity and fusion.* The corrected vision was: O.D. 20/20 + 2, O.S. 20/50-1. Suppression was marked in that no diplopia could be elicited under any circumstances. Absence of first-grade binocular single vision was demonstrated with the Worth four-dot test. The projection was faulty.

*Preoperative approach and rationale.* After four periods of three weeks each of continuous occlusion of the right eye, no demonstrable improvement in vision was obtained and no change in the character of the squint was observed.

With the noted measurements as a guide it was decided that operative attack would include a 4.5-mm. recession of the internus, a 10.0-mm. resection of the externus, and 6.0-mm. resection of the inferior oblique, all of the left eye. The exact amount of surgery to be performed on each muscle was to be determined from the findings at operation. The post-operative increased secondary abducting action of a resected inferior oblique was not overlooked with respect to its effect on the horizontal deviation. The inferior oblique being a short muscle, a larger resection was deemed impractical and imprudent; if necessary, it was felt that further elevation could be obtained at a later date by resection of the ipsilateral superior rectus.

*Operative technique.* The operative procedure will not be described in great detail as I do not consider it particularly unusual, for it differs little from other surgery of the extraocular muscles.

Under general anesthesia the left eye was prepared in the customary manner, the lashes trimmed, the eye irrigated, antiseptic instilled, and a speculum inserted. A vertical incision in the con-

junctiva, 8.0 mm. long, was made with the Stevens scissors just temporal to the semilunar fold, and Tenon's capsule was entered below the internus. The latter was isolated, freed, and recessed 4.5 mm., chromic catgut on two atraumatic needles being used. The conjunctiva was closed

traction and identifying suture and also to insure against irretrievable loss of the muscle within the orbit. The muscle was next severed from its insertion, its under-surface freed from the globe and from the underlying inferior oblique. It was allowed to retract into the orbit with its

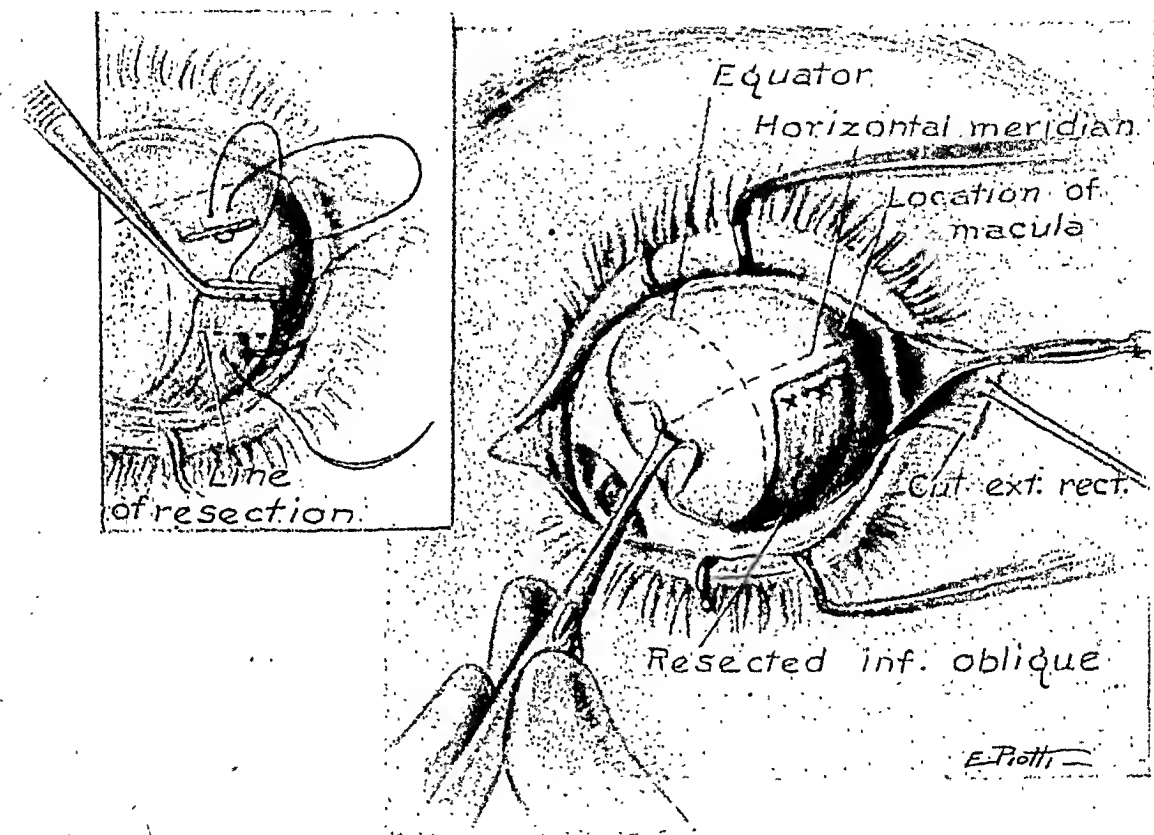


Fig. 3 (Wagman). Drawing illustrates resected inferior oblique and method of exposing operative field. Stump of external rectus is grasped with a von Graefe fixation forceps and globe rotated nasally; a Desmarres retractor is employed to retract temporal structures. Inset shows manner of taking sutures.

with a continuous suture of 4-0 black braided silk.

The globe was then rotated nasally and a vertical conjunctival incision made over the insertion of the external rectus, extending from its upper border to a point 4.0 mm. below its lower border. Tenon's capsule was entered and the externus identified and isolated. A black-silk suture was passed through the muscle near its insertion, tied, and left long to serve as a

attached black-silk suture. The stump was grasped with a von Graefe fixation forceps, and the globe adducted fully. The assistant, standing to my left and facing me, was instructed to hold the globe in the adducted position with his left hand; a medium-sized Desmarres lid retractor was slipped under the temporal border of the incised conjunctiva, including the retracted rectus muscle, and the assistant directed to hold it with the

thumb and index finger of his right hand, palm up (fig. 3). In this manner the inferior oblique muscle was widely exposed and clearly visible through its enveloping Tenon's capsule. A Prince resection forceps was then applied 2.0 mm. from its insertion and the muscle divided. One double-armed 4-0 chromic catgut mattress suture was taken in the center of the scleral stump, then into the belly of the muscle, and the muscle resected 6.0 mm. in the manner described by Lancaster<sup>9</sup> for resection of the horizontal recti (fig. 3, inset). This was followed by similar sutures, one taken anterior to it, the other posterior. These additional sutures insured permanency of the reattachment.

A 10.0-mm classical Lancaster resection on the external rectus, employing chromic catgut material, was then carried out and the conjunctiva closed as before.

The character and development of the muscles operated on were as anticipated: the internus was hypertrophic, the externus moderately thin, and the oblique a broad and delicate structure.

At the conclusion of the operation I noted that there was slight over correction in the vertical meridian, a desirable end result. The horizontal correction appeared satisfactory.

*Operative dangers.* The important structures are in direct relationship with the most posterior, nasal aspect of the inferior oblique.

1. The macula lies about 3.0 mm. nasally and superiorly to the most posterior aspect of the insertion (fig. 3). Accordingly, extraordinary care must be exercised in dividing the muscle here and particularly in taking the sutures as described.

2. The long posterior ciliary nerve bears a similar relationship and its severance would lead to disturbances in pupillary size.

3. The optic nerve lies 5.0 mm. nasally to the posterior border of the muscle. However, injury to or severance of the nerve with a Stevens scissors is indeed a remote possibility.

4. The belly of the inferior rectus runs just superior to the inferior oblique and one must use precaution in dissection lest the former be accidentally divided.

#### POSTOPERATIVE STATUS

Scrutiny of figure 2 will impress the reader with the very satisfactory cosmetic result obtained. Moreover, measurement with prisms and the screen test at 20 feet revealed a remarkably small deviation in the primary position; namely, an exotropia of 6<sup>Δ</sup> and a left hypertropia of 3<sup>Δ</sup>. At 13 inches no measurable horizontal deviation could be elicited; as anticipated, the vertical deviation was unchanged in character and amount. These figures are significant in that they indicate the very favorable postoperative alignment for orthoptic training to develop binocularity. It will be noted that, in the primary position, a *hypotropia* of some 15<sup>Δ</sup> or more was converted into a *hypertropia* of 3<sup>Δ</sup> by resection of the inferior oblique muscle.

Study of the ductions (monocular excursions) revealed improved action of the inferior oblique in that the globe could be elevated above the median horizontal plane in adduction, but it was still markedly deficient. Also the overaction of its direct antagonist, the secondarily contracted superior oblique, was completely eliminated, indeed so thoroughly that the left hypertropia increased moderately with eyes right and down.

A mathematical evaluation of the versions (associated movements, rotations) in the six cardinal fields is set forth in figure 5. On the horizontal meridian with

eyes right there was observed to be a small exotropia and a left hypertropia, the result of postoperative paresis of the left internus and shortening of the left inferior oblique. With eyes left, a small esotropia and right hypertropia were present, indicating mild deficiency of the left external rectus and left superior rectus muscles. In eyes right and up the marked right hypertropia persisted due

that the 4.5-mm. recession of the internus was not excessive.

*Postoperative refraction.* Under atropine cycloplegia the following correction was ordered from the retinoscopy. It represented 1 diopter of plus sphere less in each eye than the full cycloplegic acceptance: O.D. +3.50D. gave vision of 20/15-1; O.S. +3.00D.sph.  $\ominus$  +0.75D. cyl. ax. 90° gave vision of 20/50-1.

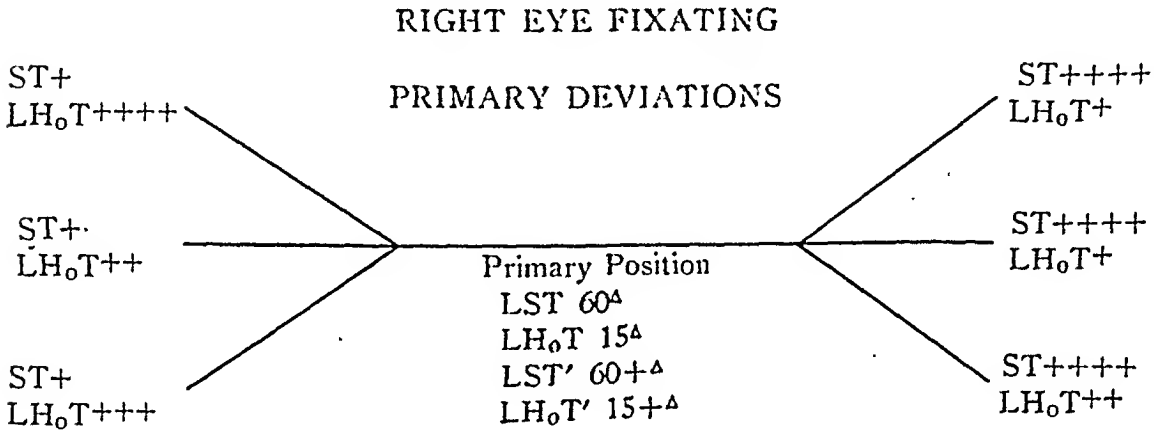


Fig. 4 (Wagman). Preoperative findings. Screen comitance test. Each + sign indicates approximately 15<sup>Δ</sup> of deviation. Hypotropia present in all fields, most pronounced in field of action of left inferior oblique muscle. Note marked deviation in right lower field due to contracture of left superior oblique. ST = esotropia; XT = exotropia; HT = hypertropia; H<sub>0</sub>T = hypotropia; R = right; L = left; (') indicates measurements at 13 inches.

to residual weakness of the left inferior oblique. In eyes left and up, a small right hypertropia was similarly elicited; this, however, was the result of a congenitally weak left superior rectus. A left hypertropia with eyes right and down was the result of a now restricted left superior oblique, the effect of shortening of the left inferior oblique. A small left hypertropia in eyes left and down indicated minor inadequacy of the left inferior rectus, very likely the result of the marked supporting effect of the shortened inferior oblique.

The near point of convergence measured 80.0 mm., with the left eye deviating outward at that point. This suggested

After the patient had worn the correction for one week the left eye became exotropic in the following amount: at 20 feet, 16<sup>Δ</sup>; at 13 inches, 20<sup>Δ</sup>. The correction was promptly reduced by 3 diopters of plus sphere in each eye, the final correction given being; O.D. +0.50D. sphere for vision of 20/15-1; O.S. +0.75D. cyl. ax. 90° for vision of 20/50-1. As a result of this change the measurements in the primary position remained as in figure 5. It proved the presence of an accommodative factor in this case by an amount varying from 16<sup>Δ</sup> to 20<sup>Δ</sup>.

*Orthoptic program.* At the time of this writing the patient had faulty projection and no fusion. The right eye will

be totally occluded for three-week periods. Exercises to correct the anomalous correspondence are being carried out three times weekly, after which binocular training will be instituted. When binocularity in the primary position is established the patient will be considered as having attained a cure, in the limited sense, of course.

with vertical components invariably so. It is pointed out that old paralytic squints commonly approach concomitancy and that the underlying paralysis is frequently overlooked.

An outline for a minimum preoperative study of ocular motility and binocular correlation is presented.

A case of double elevator paresis (su-

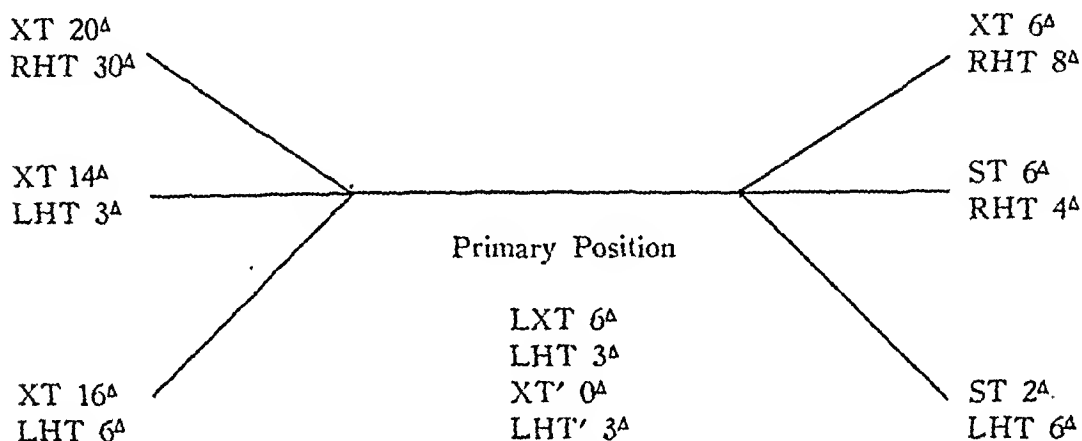


Fig. 5 (Wagman). Postoperative findings. Measurements with prisms and screen test. Note favorable measurements in primary position, particularly at 13 inches. Likewise noteworthy is the elimination of overaction of left superior oblique in its field of action, eyes right and down.

#### SUMMARY AND CONCLUSIONS

The operation of resection of a paralytic inferior oblique muscle is presented as a practical and effective procedure in selected cases of hypotropia and overaction, spasm or contracture of the superior oblique. Only one report of this operation appears in the literature.<sup>1</sup>

The recognition and need for the surgical correction of the vertical deviations is stressed. Most heterotropias are considered to be of paralytic origin, those

perior rectus and inferior oblique) of the left eye with overaction of the ipsilateral superior oblique is reported. A 6.0-mm. resection of the inferior oblique muscle was performed in conjunction with a recession and resection operation on the internal and external rectus, respectively. A *hypotropia* of more than 15<sup>A</sup> was converted into a *hypertropia* of 3<sup>A</sup>. Likewise a satisfactory horizontal alignment was obtained.

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## UNUSUAL TYPE OF CORNEAL OPACITIES

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During the seven-months' period, March through September, 1944, eight cases presenting an unusual type of corneal opacity were seen by us,\* occurring in soldiers in New Guinea. These eight cases are reported because they present this unusual type of corneal opacity which is of unknown etiology, and because an eye from one of the patients was studied histologically.

### CASE REPORTS

CASE 1. A Pfc., aged 24 years, came to the eye clinic for the first time on March 13, 1944. This soldier stated that during the three days preceding his coming to the clinic he had noted "blurred vision" in both eyes. Since the onset of his visual difficulty he had been bothered by "glare" when working outdoors.

This soldier considered himself in good health. He had been overseas for approximately six months and had taken 0.1 gm. of atabrine daily during this time. He had not been ill during the overseas period and could not recall any change in his usual dietary regime.

*Ophthalmologic examination* revealed a visual acuity of 20/50 in the right eye and 20/40 in the left eye, with correcting lenses. During the testing of the visual acuity, the patient shaded his eyes with his hands in an attempt to decrease the diffusion of light in the examining room. The eyelids and conjunctivas were normal in appearance. Circumcorneal injection was absent. Irides were normal in color. The pupillary reactions were active. Ophthalmoscopically, the anterior segments of the eyes appeared hazy. In addition, a very fine, brownish stippling was visible. This stippling seemed to be located on the posterior surfaces of the corneas or anterior surfaces of the lenses. Several small spokelike opacities were visible in the periphery of the lenses, and through the haze the fundi appeared normal. The changes observed were present in both eyes to about the same degree of intensity.

A tentative diagnosis of hydrops and opacities of the lenses and corneas was made. The patient was hospitalized. A complete physical examination gave normal results. Routine blood counts and urinalysis were normal. Blood calcium, phosphorus, and blood-sugar determinations were within normal limits. During

\* Capt. Lloyd H. Mattice (MC), A.U.S., and Capt. B. K. Williamson (MC), A.U.S., each contributed a case record to this study.

hospitalization, the patient received the usual dietary routine and 0.1 gm. atabrine daily. Two days later, on March 15, 1944 (five days after onset), the patient noticed the disappearance of "glare" and he felt that his vision had returned to normal. Reexamination of the eyes revealed a visual acuity of 20/30 with each eye and by a slight alteration in the lens prescription the acuity was further improved to 20/20. Ophthalmoscopically the spokelike opacities in the lenses and the hazy appearances of the anterior segments had disappeared. Normal fundi were confirmed. However, the fine stippling noted upon the original examination was still present and appeared unaltered in both amount and distribution. A slitlamp was not available, so the location of the stippling could not be definitely determined. The patient was dismissed from the hospital, and since he belonged to a local unit he was asked to return for monthly checkups. The patient was told to resume his usual work, habits, and diet.

The soldier returned to the eye clinic during the months of April, May, June, and July, 1944. On all visits the visual acuity was found to be 20/20 with each eye and the stippling remained unaltered. On August 6, 1944, his last visit, visual acuity was 20/20 with each eye, but the fine stippling had disappeared. The eyes appeared normal when examined with the binocular loupe and ophthalmoscope.

CASE 2. A private, aged 21 years came to the eye clinic on May 4, 1944, complaining of having had blurred vision throughout the preceding week. The onset of the visual difficulty had occurred within a 24-hour period, and, to the patient's knowledge, it had remained unchanged during a six-day period. The patient could not associate the onset of the visual difficulty with any physical illness. He had been overseas for seven

months and had not been ill during that time.

*Ophthalmologic examination* revealed a visual acuity of 20/70 with each eye. Examination of the corneas, conjunctivas, lenses, and irides with the binocular loupe revealed no abnormalities. Ophthalmoscopically, a very fine, brownish stippling with bandlike configurations was visible. These opacities seemed to be located in the posterior corneas or on the anterior surfaces of the lenses as determined by parallax phenomena. The fundi appeared normal through the haze of the anterior segment.

The patient was hospitalized and a complete physical examination made. Routine blood counts, urinalysis, and blood sugar and blood calcium determinations were found to be within normal limits. No systemic cause for the ocular condition was found. The patient remained in the hospital for one week on the usual hospital diet and had the suppressive dose of 0.1 gm. atabrine daily. He was ambulatory throughout his hospital stay and felt that he was in good health.

Upon discharge from the hospital the visual acuity was 20/20, bilaterally. The haze in the anterior portions of the eyes had subsided, but the fine brownish opacities could still be seen with the ophthalmoscope. The configuration and number of opacities seemed unchanged from the original examination. A cause for the fine opacities in the eyes was not found. The patient was not seen again.

CASE 3. A private, aged 25 years, was admitted to the hospital on May 23, 1944, with the complaint of "blurred vision." The onset of the visual difficulty had been rather sudden; that is, within the preceding 12 hours.

On the day prior to admission to this hospital, the patient had been discharged from a hospital in the local area where he

had been hospitalized for eight days because of malarial fever. *Plasmodia vivax* had been demonstrated in a smear of the blood, and the patient had received the usual malaria therapy; namely: atabrine 0.4 gm. thrice the first day, 0.3 gm. thrice the second day, and 0.2 gm. twice daily for the next four days, and thereafter, 0.1 gm. daily as the suppressive dose.

*Physical examination* at this hospital was essentially negative except for the ophthalmologic findings. The patient had a moderate yellow discoloration of the skin from deposition of atabrine. According to the patient, there had been a slight weight loss of five pounds over the past few weeks. Repeated examinations of blood smears for malaria parasites were negative. The patient had been stationed in New Guinea for six months prior to his first hospitalization. He contended that during the whole of the time he had been stationed in New Guinea he had followed the suppressive regime of 0.1 gm. atabrine daily. The fever for which he had been hospitalized during the preceding week was to his knowledge, his first attack of malaria. There was nothing in his past history to indicate any previous difficulties with his eyes.

*Ophthalmologic examination* revealed a visual acuity of 20/100 with each eye. Gross examination of the external portion of the eyes revealed no abnormalities except for a glassy or polished appearance of the corneas. With the binocular loupe, a faint haze could be observed in the anterior segment of the eyes, but the haze could not be accurately located in either the corneas, aqueous, or lenses. The irides were of normal texture and color. With the ophthalmoscope, a fine, brownish stippling could be discerned amidst the haze in the anterior segments of the eyes. The fundi were not seen distinctly but gross pathologic change in the interior of the eye did not seem to be present. A

tentative diagnosis of edema and opacities in the posterior corneas or lenses, or both, was made.

Ophthalmoscopic examination was repeated three times in the two-week period following admission to this hospital. The appearance of the eyes, as studied with the ophthalmoscope and binocular loupe throughout the two-week period, was essentially unchanged from that observed at the original examination. However, the visual acuity decreased to 20/200 with each eye on the fourth day after admission and remained at this level thereafter.

The patient was placed on the usual hospital regime and received no therapy except the usual suppression atabrine, 0.1 gm. daily. On the seventh day after admission, the ward officer noticed the appearance of jaundice. The patient complained of moderate anorexia and nausea. A diagnosis of acute infectious hepatitis was made. The patient was placed on a high-vitamin, high-carbohydrate, high-protein, low-fat diet with 2 mg. of thiamine thrice daily as supplementary therapy. By the eleventh day of hospitalization he had become progressively worse. The jaundice had increased in intensity, and the patient complained of generalized abdominal pain and diarrhea. The oral intake of thiamine was discontinued, and the patient was given 25 mg. of thiamine intramuscularly twice daily, intravenous glucose and blood transfusions. On the thirteenth day, fresh blood was found in the stools and the tissues began to bleed at the sites of intravenous injections. On June 4, 1944 (14 days after admission), the patient vomited blood, the pulse became progressively thready, and he died.

An autopsy was performed and a pathologic diagnosis of acute yellow atrophy of the liver was made. The eyeballs were obtained at autopsy. Sections were made of one eye and several of the

sections were available to us for study. The remaining sections were forwarded to the Army Medical Museum.

The sections in our possession were sent elsewhere for microscopic study. We quote from Dr. Parkhill's\* report: "I find a localized pigmentation of the basal layers of the corneal epithelium in the region of the limbus on one side of the eye. There are minute pigment particles scattered along the posterior endothelial layer of the cornea and a few enmeshed in the pectinate ligament. There is also an area of increased pigmentation of the anterior layers of the iris on the same side as that which showed the pigmentation of the corneal epithelium. The pigment on the iris is mostly intracellular. These pigment granules both intracellular and extracellular are all fairly fine and most likely melanin, although in this case, I believe, it would require an iron stain to rule out the possibility of their being blood pigment. I did not find any pigment in or on the anterior lens capsule. There are numerous small vacuoles in the cortex just under the anterior lens capsule, but these are most likely artifacts."

CASE 4. A T/4, aged 28 years, came to the eye clinic on July 20, 1944. He stated that two days previously he had noticed sudden onset of blurred vision with each eye. He described the visual complaint as "looking through a dirty window pane." The patient could recall no previous ocular difficulties and considered himself in good health. He had been in New Guinea for a period of four months, and did not believe that there had been any departure from the usual dietary fare of his unit. Suppressives atabrine medication of 0.1 gm. daily had been followed by the patient.

*Ophthalmologic examination* revealed a visual acuity of 20/40 with each eye. Examination of the external portions of the eyes with ordinary illumination and with the binocular loupe revealed no abnormalities. With the ophthalmoscope, fine dustlike particles were seen in the anterior segments of the eyes and seemed to be located in the posterior portions of the corneas. In addition, a very slight, diffuse haze was noticeable, but this haze did not prevent a thorough study of the fundi, which were normal in appearance.

Complete *general physical examination* was carried out and was found to be essentially normal. Routine blood counts and urinalysis were within limits of normal. There was a slight, yellowish tinge to the skin that was considered the result of routine suppressive atabrine ingestion. An explanation for the objective findings in the eyes was not found.

On July 22, 1944, four days after onset of blurred vision, ophthalmologic examination was repeated. Visual acuity, uncorrected, was 20/20 with each eye. The slight haze in the anterior segments of the eyes as seen with the ophthalmoscope had disappeared. However, the fine dustlike particles were still evident and had not changed in their configuration or distribution. The fundi were again normal. The patient was returned to duty and was not seen again.

CASE 5. A Pfc., aged 27 years, came to the eye clinic on August 4, 1944. This soldier wished to have his glasses checked.

*Ophthalmologic examination.* The visual acuity, uncorrected, was 20/50 right eye, 20/40 left eye. With the glasses he was wearing (R.E. +0.50D. sph.  $\approx$  +0.50D. cyl. ax. 175°; L.E. +0.75D. sph.  $\approx$  +0.25D. cyl. ax. 25°) the visual acuity was 20/20 bilaterally. Inspection of the corneas, eyelids, conjunctivas, irides, and pupils revealed no abnormali-

\* Histologic examination was made by Dr. E. M. Parkhill, Section on Pathology, Mayo Clinic, Rochester, Minnesota.

ties. Ocular rotations were complete, convergence adequate, and the near point of accommodation was within normal limits. Upon ophthalmoscopic examination, a fine, brownish, diffuse stippling was visible and seemed to be located in the posterior portions of the corneas. The stippling was of equal distribution in the two eyes. These fine opacities did not interfere with the examination of the interior of the eyes. The hazy appearance of the anterior segments noted in other cases was not present in this patient's eyes. Fundi were normal.

The patient was questioned relative to previous difficulties with his eyes. He revealed that in March, 1944, five months previous to admission to the clinic, he had had a diminution of vision. He described the disturbance of vision as "blurring as though I were looking through a dirty window pane." He stated that both eyes had been affected. Further interrogation revealed a gradual onset over a one- to two-day period and a duration of two to three weeks with ultimate return of vision to normal. He had not consulted a medical officer during this episode of blurred vision.

The patient had been overseas approximately 12 months and considered himself in average health. He had experienced several bouts of diarrhea and had contracted one upper-respiratory infection during his overseas service. He contended that he had taken the usual suppressive atabrine of 0.1 gm. daily. A slight, yellowish tinge was evident upon examination of the skin. A general physical examination was essentially normal. The patient was returned to duty and we did not have an opportunity to reexamine him.

CASE 6. A Pfc., aged 24 years, was evacuated from a forward area to a nearby hospital for refraction. We had

the opportunity to study this patient in conjunction with the medical officer to whom the patient was assigned.

He was seen for the first time on August 30, 1944, and stated that for approximately 30 days prior to admission, the vision of each eye had been blurred. He felt that his vision had become progressively more blurred.

The patient had been overseas for approximately nine months. There was no antecedent history of visual difficulties. He had considered himself to be in good health. The medical officer in charge could not find evidence of systemic disease that might explain or contribute to the visual complaint. Suppressives atabrine, 0.1 gm. daily, had been taken by the patient since he had been overseas.

Visual acuity was 20/30 with the right eye, 20/200 with the left eye. The conjunctivas were normal in appearance. Congestion of the circumcorneal blood vessels was not present. The irides were equal in color and texture. With the binocular loupe, two small, gray infiltrates were seen in the deeper portions of the substantia propria of the left cornea. These infiltrates had fuzzy outlines. The cornea of the right eye appeared normal when examined with the binocular loupe. With the ophthalmoscope, a fine, brownish stippling could be seen in both eyes and seemed to be located in the posterior portions of the corneas. The number of brownish deposits were approximately equal in the two eyes, and these deposits were arranged somewhat in the shape of a broad band that extended horizontally across the corneas. Although a very slight haze seemed to be present in the anterior segment of the right eye, the fundus was easily seen and appeared normal. The details of the fundus of the left eye were obscured by a definite haze in the anterior portion of the eye. A tentative diagnosis of opacities in the posterior portions

of both corneas with edema of the left cornea was made.

The patient was confined to the hospital for observation. The usual hospital diet was supplemented by the administration of one multi-vitamin capsule thrice daily, and 2 mg. of thiamine thrice daily. One week later visual acuity had improved to 20/20 with the right eye; 20/30 with the left eye. The number and distribution of the fine opacities in the two eyes, as seen with the ophthalmoscope, were unchanged with respect to the original examination. The two small gray infiltrates in the substantia propria of the left cornea had decreased in size and intensity and were barely discernible with the loupe. A definite diffuse haze was still present in the interior of the left eye but an accurate study of the fundus was possible and found to be normal.

Ten days after admission to the hospital, visual acuity was 20/20 with each eye. The haziness had subsided and the infiltrates in the cornea of the left eye had disappeared. The fine stippling in the corneas was unaltered. The patient felt that he had recovered his usual vision.

The thiamine and multi-vitamin supplements to the diet were discontinued on the twelfth day. General physical examination was again essentially normal. The patient had felt in good health during his hospital sojourn. He was sent to duty two weeks after admission, and has not been available for reexamination.

CASE 7. A Pfc., aged 26 years, was evacuated from a forward area to a nearby hospital on September 15, 1944. History of his illness, as related by the patient, was as follows: During the middle portion of the month of August, the patient began to experience periods of vomiting. These episodes were usually brief and occurred shortly after mealtime. Vomiting occurred daily and no

therapy was prescribed by the unit dispensary. On September 1, 1944, the patient was hospitalized for malaria. He continued to vomit throughout the first three days of hospitalization. The malaria was treated with atabrine. Three days following the completion of malaria therapy, on September 9, 1944, the patient noted onset of blurred vision in both eyes. Except for a five-day period during the hospitalization for malaria in which he received atabrine in therapeutic doses, he had taken the usual recommended suppressive amount of 0.1 gm. daily. He had been overseas 17 months.

The medical records of his previous hospitalization were studied; they revealed a positive blood smear report for *Plasmodia vivax* on September 3, 1944. Malarial parasites were not found on subsequent smears of the blood. The patient was given atabrine 0.4 gm. three times the first day, 0.3 gm. three times the second day, 0.2 gm. twice daily for the succeeding four days, and 0.1 gm. daily thereafter.

*Ophthalmologic examination* was performed at this hospital on September 16, 1944. Visual acuity was 20/70 with each eye. The eyelids and conjunctivas were normal in appearance. Tiny, circumscribed droplets of clear fluid throughout the posterior layers of the corneas were easily visible with the binocular loupe. The irides were equal in color and seemed to be of normal texture. The anterior surfaces of the lenses could not be adequately studied because of the haziness of the corneas. With the ophthalmoscope, fine, discrete brownish-black deposits were visible, and these deposits seemed to be diffusely intermingled with the haze in the posterior portions of the corneas. The fundi could not be seen. A diagnosis of bilateral edema of the cornea with pigment deposition was made.

The patient had a sallow appearance.

According to the patient, there had been some loss of weight in recent weeks. The skin and mucous membranes were closely inspected. No abnormalities of these tissues could be found, except for a moderate pale-yellow discoloration that is so often seen in patients taking atabrine. Other than the findings already noted, general physical examination was essentially negative. The spleen was not palpable. Routine urinalysis and blood counts were within the limits of normal. Malarial parasites were not found on a thick blood smear.

The patient was placed on a regular dietary regime supplemented with the intake of eggs and carrots. He consumed several cans of dehydrated carrots for several successive days but soon lost his appetite for this food. Throughout the period of hospitalization, he was able to consume two eggs three times a day.

On September 19, 1944, four days after admission, examination of the eyes was repeated. Visual acuity had improved to 20/50 bilaterally. The edema of the corneas seemed to be less intense as studied with the binocular loupe. The fine stippling, as seen with the ophthalmoscope, was unchanged from the previous examination. The fundi were now faintly visible and appeared normal. On September 21, 1944, the edema of the corneas had almost disappeared. The fine, brownish deposits were much fewer in number but had not altered in location. Normal fundi were confirmed. Visual acuity was 20/40 bilaterally.

On October 2, 1944, 18 days after admission, visual acuity was 20/20 bilaterally. The corneas were clear. No evidence of a previous edema could be found. The fine stippling had also disappeared and the eyes appeared normal throughout. The patient felt that he had recovered full vision. He was discharged to duty soon after the last examination

of the eyes and has not been available for reexamination.

**CASE 8.** A Major, aged 34 years, a medical officer, consulted one of us on June 25, 1944. He requested a complete examination of his eyes because he feared that he was suffering from glaucoma. The patient related that within the preceding month he had noted haloes around electric lights. The halo phenomenon was particularly noted at night when the patient was facing the headlights of an approaching vehicle. He had no other complaints referable to the eyes and considered himself to be in average health. This complaint referable to the eyes was a rather unusual one. He gave the impression of stability; he seemed satisfied with his work, and there were no other bizarre complaints. Psychoneurotic tendencies did not seem to exist. He had been overseas approximately nine months.

*General physical examination* was negative.

*Ophthalmologic examination.* As complete an examination as possible was made of the eyes. Visual acuity was 20/30 bilaterally. The conjunctivas were clear throughout. The corneas were studied with the binocular loupe and seemed normal. The irides were normal in color. The aqueous appeared clear. Pupils were equal and the pupillary reactions to direct light and convergence were normal. With the ophthalmoscope, the media appeared clear, and the fundi normal. Perimetric visual fields were normal. The intraocular pressure seemed to be within normal limits as tested by palpation. An adequate explanation for the visual difficulties did not seem to exist. A diagnosis of glaucoma could not be supported.

The patient was informed of the negative results of the ophthalmologic examination but it was suggested that he go to a general hospital and have a series of

tonometric determinations of the intra-ocular pressure.

At the time of this patient's visit, we had already observed the first three cases reported in this series. The thought occurred to us that this patient's ocular difficulty might represent an incipient stage of the disease described in the first three cases. He was urged to supplement his diet with whatever multi-vitamin tablets were available, and, if possible, to return for reexamination.

Two weeks later the patient returned to this area. He reported that the visual phenomena of haloes had disappeared. Tonometric measurements of the intra-ocular pressure had been performed twice daily over the two-week period and always found to be within the limits of normal. The patient had ingested from 4 to 6 multi-vitamin tablets daily. Ophthalmologic examination was repeated and, the results were found to be the same as on the previous occasion except that visual acuity had improved to 20/20 in each eye.

In retrospect, this case was thought to represent an incipient phase of the disease described in this report. The subjective complaint could be explained on the basis of a corneal edema that was too mild to be detected by the instruments available.

#### DISCUSSION

The cases reported in this paper seem to have certain common ocular manifestations that warrant their study as a group. With the exception of case 8, a certain type of brownish opacity was observed in the anterior segments of the eyes. All of the individuals experienced a diminution of the visual acuity. The visual difficulty was always bilateral and in most instances the two eyes were affected equally. In two cases (3 and 7), the diminution of the visual acuity followed an attack of malaria. In all others

an antecedent history of systemic disease could not be found. Complete recovery of the visual function in a relatively short period of time was noted in all cases with the exception of case 3. In the latter instance, a study of the progress of the ocular condition was interrupted by the death of the individual.

A detailed description as to the location of the abnormalities noted in the eyes of these individuals was obviously hampered by the nonavailability of a slitlamp. With the instruments available, we could only surmise the location of the changes observed. However, we were fortunate in obtaining a microscopic section of an affected eye, which gave us some clue as to the nature of the disease process and confirmed in some degree our opinions as to the site of the disease.

The finding of fine, pigment particles scattered along the posterior endothelial layer of the cornea in the pathologic specimen confirmed the speculation that the brownish opacities were located in the posterior layers of the cornea. However, these opacities did not produce the blurring of the vision, since they were so frequently noted following complete recovery of the visual acuity. The brownish particles were part of the disease process and remained as residuals when the disease had subsided. In cases 1 and 7, it was found that the opacities ultimately disappeared.

The haze noted in the anterior portions of these patients' eyes was the factor responsible for the lowered visual acuity, for the vision improved as the haze became less dense. The pathologic specimen did not aid in locating the position or in explaining the nature of this haze. Vacuoles in the lens substance were noted, but these were thought to be artifacts. The lens epithelium seemed normal. The contents of the anterior chamber were lost in the preparation of the microscopic sec-



tion. In case 1, a transient, spokelike opacity was noted in the lens substance. This raised the possibility that an edema of the lens substance was responsible for the haze. In two cases (3 and 7) definite edema in the substances of the cornea was visible.

The absence of pain and photophobia, the lack of circumcorneal or conjunctival injection, the normal appearance of the irides and pupils ruled out local diseases of the eye such as iritis, conjunctivitis, scleritis, and keratitis. The fundi in all cases were normal. There were insufficient signs to support a diagnosis of glaucoma. This lack of the usual signs of local ocular disease caused us to seek an etiologic explanation through systematic examination.

All cases were examined for evidence of systemic disease as well as for avitaminosis. General examination was essentially normal in all cases with the exception of the eye findings. In case 3 an infectious hepatitis developed after the patient's admission and he died. All of the patients had considered their health to be good. No signs of vitamin deficiency could be ascertained. Blood counts and blood-chemistry studies were within normal limits. Malaria smears were negative at this hospital.

It was felt that the cause of the haze and the corneal opacities was a result of a systemic disturbance which was not

demonstrable with the facilities available to us.

### SUMMARY

1. Eight cases are reported presenting similar disturbances of visual acuity.

2. The patients in each of these cases experienced a diminution of visual acuity proportionate to the density of a haze noted in the anterior portion of the eyes. Visual acuity returned to normal in a short time except in the case of the patient who died.

3. In seven of these cases, fine, brownish, dustlike opacities were observed in the anterior segments of the eyes. The patient in case 8, who complained of peculiar haloes, was thought to represent an incipient phase of the disease described.

4. Microscopic sections of the eye of one of these patients, who subsequently died of hepatitis, showed the brownish opacities to be "... minute pigment particles scattered along the posterior endothelial layer of the corneas. ..."

5. No evidence of systemic disease or avitaminosis could be found to account for the disease process.

6. The cause of the ocular condition as described warrants further study.

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# NEW PERMANENT HAND MAGNET IN THE LIGHT OF PRESENT-DAY MAGNET-OPERATION METHODS\*

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In practical ophthalmology various types of electromagnets (hand and giant) are now in general use for the removal of iron and steel splinters from the eye. In most cases the removal of the splinters is effected by the application of these magnets. However, the use of electromagnets entails certain inconveniences: first of all, the large size and considerable weight of the magnet, the crowding of the operative field when the magnet is brought up to the eye, the need of a special room (provided with alternating current and transformer) for the operation, the high cost of the magnet, and other factors.

Many clinicians prefer to use giant magnets, but there are quite a number who use the hand magnet exclusively. The clinic of Academician W. W. Filatow (Odessa) and many other clinics as well are of the view that possession of a giant magnet does not exclude the need of hand magnets. Both types of magnet are required for the correct application of magnetic aid. Both magnets have their special fields of application.

Considering the inconvenience of working with giant magnets, and acknowledging the value of hand magnets, Prof. S. F. Kalfa<sup>1</sup> (Odessa) and I<sup>2</sup> proposed in 1939 the use of permanent magnets in the practice of ophthalmology. Although the latter have been known for a long time, they did not find practical use because of their low magnetic power and because they soon became demagnetized under various external influences.

\* Because of transportation difficulties, the author's proof of this paper has not been available for corrections.

The removal of splinters, apparently from the ocular surface, with the aid of a magnet stone was first reported by the Strassburg physician Brunswig (according to Feldhaus,<sup>3</sup> 1903) in a publication issued first in 1497, then in 1498 and 1534. In the 1534 edition the author says, "When iron gets in somebody's eye he should open the eye and a magnet stone will pull off the splinter." The originator of this method is unknown.

Fabricius Hildanus (according to Hirschberg,<sup>4</sup> 1882) in 1656 used natural magnets for the removal of splinters from the cornea. About 100 years later (1745) a publication describes the removal of iron splinters from the iris by the aid of a permanent magnet (according to Snell,<sup>5</sup> 1880) and in the year 1779 such a procedure appears in an article by Morgani (cited by Hirschberg, 1882): The latter tried, though without success, to remove a splinter by means of a magnet in a case of corneal ulcer. He nevertheless recommended this method in such cases.

A steel splinter from the sclera was first removed with a permanent magnet by Meyer (cited by Himly, 1843), who accomplished this operation in 1842. Himly (1842) pointed out the possibility of removing splinters from the anterior chamber by means of a magnet.

Dixon in 1858 and W. Cooper in 1859 (both cited by Wagenmann,<sup>6</sup> 1921) used the magnet for the purpose of drawing a foreign body from the interior of the eye to the wound. McKeown<sup>7</sup> (1874) was the first to penetrate into the vitreous with a permanent magnet for the removal of iron splinters.

In the Russian literature the applica-

tion of a permanent horseshoe-shaped magnet for the removal of splinters from the cornea was first mentioned in the reports of Pergamin<sup>8</sup> (1882).

Magnets of that and even of a later time (McKeown,<sup>9</sup> 1874, 1878; Snell,<sup>10</sup> 1881) proved to be imperfect. Thus Snell in his publication says: "It is difficult to get a magnetic stone having sufficient power at its ends, when they are small, which could practically serve for the detection and removal of steel and iron." This was the circumstance which led ophthalmologists of that time to look for more reliable apparatus, which then proved to be the hand electromagnet (Hirschberg,<sup>11</sup> 1876; McHardy,<sup>12</sup> 1878; Krukow,<sup>13</sup> 1884 and others). The introduction of electromagnets in the practice of ophthalmology of that time was a big step ahead. To this day electromagnets are the most valuable apparatus in our operating rooms.

At present, however, there is the possibility of returning to the use of permanent magnets. The old-time permanent magnets, made of ordinary sorts of steel, did not possess great ultimate induction (Br)—a high degree of magnetization—and at the same time great coercitive power (Hc); that is, the power to preserve its magnetic state against the action of an external demagnetizing field. The materials now used for permanent magnets (iron, nickel, and aluminum alloy, the alloy "alnico") possess higher magnetic properties, surpassing those of many of the known magnetic steels. The alloy was patented toward the end of 1932 by Mischima and named M.K. by its originator (according to Meskin,<sup>14</sup> 1937). The composition was reported by Mischima within large limits (Ni.—10-49 percent, Al.—1-20 percent, C—.05 percent, Fe—the rest). At present this alloy has been adopted by various countries. Similar to this alloy but of still greater

power is the alloy "alnico" (aluminum, nickel, cobalt, iron).

A table of magnetic characteristics of the most important sorts of magnetic steel (according to data found in the literature) follows:

Name of Steel	Ultimate induction (in gauss) Br	Coercitive power (in ersteds) Hc
Carbon steel, hardened at 850°-0.84% C	7,600	52
Wolfram steel	10,600	65
Chrome steel	9,000	70
Cobalt steel	9,000	200
English Cobalt—chrome steel 15% Co	9,500	170
Iron-nickel—aluminum alloy	7,500	450
Alnico	10,000	650

Iron-nickel-aluminum alloy in its mechanical properties presents a very hard and brittle material which endures no mechanical treatment except polishing. The superiority of this alloy, in addition to its magnetic properties, lies in the fact that it requires no thermal treatment except of tempering in the interval 450 to 700°C. Preparation of permanent magnets from this alloy consists only in obtaining the cast. Therefore the production is inexpensive. Magnets of iron-nickel-aluminum alloy will have to supplant all other permanent magnets. Its great superiority consists in the fact that the shape and scale of the magnet can be taken as approaching to an infinitely small magnet in order to obtain equal magnetic power. In order to magnetize magnets of nickel-aluminum steel a very strong magnetic field, of the order of 10,000 ersteds, is required because of the great coercitive power. For small magnets this task is solved quite simply by placing the magnet between the poles of a strong electromagnet. Magnets of this alloy are stable to usual temperature increase and mechanical vibration (Rose,<sup>15</sup> Meskin).

We began to study the application of permanent magnets in the practice of ophthalmology in 1938. The first removal of a foreign body with the permanent magnet was accomplished in the Odessa Eye Clinic by Academician W. P. Filatow on the 27th of April, 1939.

The patient, R-ka, a girl, aged 11 years, during play on March 6, 1939, received a blow to her right eye. She came to the eye clinic on April 26, 1939, complaining of reduced vision. Examination showed a slight pericorneal injection. A small grayish scar was found on the cornea at the superior exterior quadrant in the direction of the 10-o'clock position. The iris was of a greenish color. At about the 10-o'clock position on the pupillary border a foreign body about 2 by 1 mm. in size was seen to be entangled in the iris. The pupil reacted normally to light. Visual acuity was 0.35—0.4. The magnetic test by the Volkmann magnet gave positive results. The magnetic test carried out after this with our permanent magnet was also positive. On April 27, 1939, the magnet operation was performed. After akinesia, epibulbar and retrobulbar anesthesia, an incision was made of the bulbar conjunctiva and the sclera in the superior exterior direction. Then the final incision of the cornea was made. The foreign body was easily removed by holding the permanent magnet against the wound. The weight of the foreign body was 0.004 gm. The next day the eye was quiet, the chamber restored, the pupil large but of irregular form. On April 29th the eye was quiet, the eyeground clearly visible. The patient left the Clinic and was transferred to ambulatory treatment.

The first model of the magnet was pearshaped. It was 11 cm. in length and 335 gr. in weight, and was made of iron-nickel-aluminum alloy of approximately the following composition (Al—11-14 percent, Ni—20-25 percent, Cu—3-5

percent, Fe—56-66 percent). The final induction of the given pattern was 5,000 to 6,000 gauss. Its coercitive power amounted to 500 to 550 ersteds. The measure of the attractive power of the magnet showed that it was even a little greater than that of the Hirschberg manual electromagnet. The magnet attracts a small iron ball of 0.7 gm. on a horizontal plane at a distance of 11 mm.; the Hirschberg magnet at a distance of 10 mm. The force needed to remove a ball 1 gram in weight from our magnet is 183.5 gm., for the Hirschberg magnet it is 68.9 gm.

Until the outbreak of the present war we accomplished more than 65 operations successfully by the aid of this magnet. We removed splinters from both the anterior and the posterior areas of the eye. The removal of splinters from the posterior part of the eye was accomplished diasclerally.

The second model of our magnet was prepared from the alloy "alnico" of the following composition: Al—13 percent, Ni—20 percent, Co.—7-9 percent, Fe—the rest). The ultimate induction of this magnet amounts to 7,000 gauss, and the coercitive power to 400 to 500 ersteds. The magnet consists of a cylindrical body 108 mm. in length and 210 gm. in weight, with one end pointed like that of a pencil. In both cases interchangeable caps of soft iron "Armko" go with the magnets; one straight and the other with an angle, both of which are slipped upon the plain end of the magnet (fig. 1).

The measure of the attractive power for two accidentally taken iron splinters gave the following results. One of the splinters of irregular shape, about 4 by 1 mm., in size and 12 mg. in weight, begins to vibrate on holding the magnet at a distance of 35 mm. and is attracted upward from a distance of 21 mm. The second iron splinter of irregular shape, about 7 by 3 mm. in size and 40 mg. in

weight begins to vibrate on holding the magnet at a distance of 38 mm. and is attracted vertically from a distance of 23 mm.

From experience with our magnet we were convinced that it is most effective in cases of iron splinters in the cornea or



Fig. 1 (Brotsky). The second model of the magnet, showing assembled view and the magnet taken apart (core of the alloy "alnico," case, nut, and tips).

the anterior chamber, the iris, the lens after corneal incision (anterior route). However, its diascleral application (for splinters in the posterior segment) can be accomplished only on the basis of exact X-ray data obtained by aid of the method of Komberg-Baltin and others.

Regarding the question of incision of the sclera for the removal of splinters from the posterior portion, I<sup>16</sup> proposed some modification. Formerly, after incising and separating the conjunctiva, we accomplished the incision of the sclera in meridional direction through all the coats of the eye. We found that various kinds of splinters can be removed by scleral incision, without much injury to the integrity of the choroid and retina, which is important for the preservation of ocular function. This point of view is shared by quite a number of authors (Haab, Genet, 1914; Pichler, 1918; Vogt, 1926; Elschniig, 1928, cited by Warschaw-

sky<sup>17</sup>), who recommended avoiding wherever possible the opening of the choroid and retina. For isolated trephining of the sclera we employed the cylindroconical trephine FM-II to FM-III (Filatow-Marcinkowsky) with piston or hermetical barrier inside the tube, such as has been used by Filatow previously for the transplantation of cornea and for many other operations on the sclera<sup>18</sup> (fig. 2). We also take care, by suitable pressure of the trephine on the one side, not to excise wholly the scleral disc, but to leave it in contact with the sclera in one place. We thus get something like a small window.

The steps of our latest diascleral method of removing splinters are the fol-

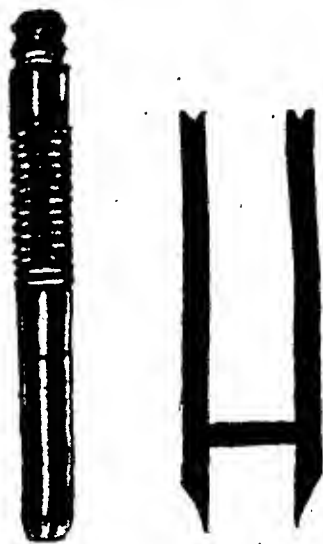


Fig. 2 (Brotsky). Cylindroconical hermetical trephine FM-III (general view and scheme).

lowing: Epibulbar and retrobulbar anesthesia; akinesia. Bridle sutures on two neighboring muscles bordering the quadrant bearing the splinter. Injection of novocaine subconjunctivally at the place to be operated on. Incision of the conjunctiva parallel to the limbus. The distance of the incision of the conjunctiva to the limbus depends on the depth of the location of the splinter. On the ends of the bridle sutures we put forceps which

by their weight extend the wound. Further extension of the conjunctival wound is accomplished by the assistant with the aid of instruments. The sclera is freed from the episclera and carefully dried. The spot of the incision (the meridian and the distance from the limbus) is measured with dividers and marked with India ink. Around this point diathermo-coagulation of the sclera is effected with a spherical tip of 1.5 mm. for 2 to 3 seconds with a current of 60-70 M.A. until a yellowish-brown color appears. Then to this part of the sclera we put a trephine FM-II to FM-III of 1.5 to 2-mm. diameter, according to the size of the splinter (on the basis of X-ray data) by which means we trephine the sclera quite easily, as a rule. The choroid remains undamaged. If necessary this aperture may be carefully and lightly enlarged by a Graefe knife. We put the magnet to the bared choroid and the foreign body then often comes out of itself, cutting the retina and choroid. In some cases, however, we have had to cut the choroid and retina. This sometimes facilitated the removal of the splinter. Seldom did we have to sound the vitreous. The reverted scleral disc is put back in its place. No suture of the sclera. Suture of the conjunctiva. Dressing on both eyes. The patient remains in bed for 6 to 7 days. The aftercare is like that prescribed after operating for detachment of the retina. In this way we succeeded in operating on 12 patients, removing the splinters in all by aid of the permanent magnet.

In most cases the splinters came out by themselves as soon as the magnet was placed to the bared choroid. In only two cases did we have to cut the choroid and retina. In one case this incision was sufficient to remove the splinter. In the other case we had to introduce the magnet end into the vitreous (in the direction of the splinter).

It should be emphasized that the diascleral method of removing splinters from the eye should no longer be a method of choice, but the preferred method for splinters in the posterior region, especially when the lens is transparent.

The anterior method of splinter removal (in the sense of bringing the foreign body from the posterior segment into the anterior chamber) is not to be ignored, but the sphere of its indications is limited.

For the right application of our magnet—that is, for its diascleral application according to exact X-ray data—the incision of the sclera is made above the place where the foreign body is located, and the distance between magnet and splinter does not exceed 12 to 13 mm. This, in most cases, assures the removal of the splinter by our permanent magnet.

Specialists using the diascleral method well know how easily the eye endures this incision, how often the diascleral removal of the splinter reduces the acute inflammation caused by invasion of germs together with the splinter (rapid vanishing of hypopyon, of fibrinous exudate at the anterior surface of the lens).

The method now at our disposal of preliminary cauterization of the part of the sclera to be intersected (diathermo-coagulation, galvanocoagulation) seems to be a reliable prevention of a possible detachment of the retina, which was until now one of the main objections to the diascleral method.

Our proposed modification of isolated scleral incision with the aid of a cylindro-conical trephine (Filatow-Marcinkowsky FM-II to FM-III) with piston or hermetical barrier inside the tube assures the convenient application of the magnet and the easy removal of the splinter without further need of violating the integrity of the choroid and retina. The opening of the sclera by this trephine can be accomplished very quickly with mini-

mal risk of damaging neighboring parts.

This scleral incision favors the successful application of our permanent magnet, which has, in some regards, essential superiority over the electromagnet, especially in cases when the magnet operation has to be accomplished in more or less primitive situations, as may often happen in war conditions.

### SUMMARY

In magnetic surgery there are many adherents of the sole use of giant magnets, but there are quite a number of those who prefer the hand magnet. The Clinic of Academician W. P. Filatow (Odessa) and many other clinics as well are of the view that the possession of a giant magnet does not exclude the need of possessing hand magnets. Both types of magnet are needed for the proper application of magnetic aid.

Considering the inconvenience of working with giant magnets, and acknowledging the value of hand magnets, it was still before the war in 1939 when Prof. S. F. Kalfa and I proposed the use of permanent magnets in the practice of ophthalmology. The materials used for these magnets were: iron-nickel-aluminum alloy and the alloy "alnico" possessing high magnetic properties (great ultimate induction and great coercitive power). The author studied the problem of applying permanent magnets in the practice of ophthalmology in 1938. However, the first operation with our proposed magnet was performed in the Odessa Eye Clinic by Academician W. P. Filatow on the 27th of April, 1939. The splinter was easily removed from the iris.

The first model of the magnet was pearshaped. With this magnet more than 65 operations were performed for removal of splinters from the anterior as well as the posterior areas of the eye. The second model of the magnet looks

like a pencil 108 mm. in length, 20 mm. in diameter, and 210 grams in weight.

From experience with our magnet we were convinced that its greatest efficiency is demonstrated in connection with exact X-ray data in regard to the localization of the fragment in the eye. For this purpose I use the method of Komberg-Baltin.

In regard to the question of incising the sclera for the removal of splinters I have proposed modification. For isolated trephining of the sclera we employed the cylindroconical trephine FM-II to FM-III (Filatow-Marcinkowsky) with piston barrier inside the tube. The author recommends uneven pressure on the trephine when excising the scleral disc. With suitable pressure of the trephine on one side, the scleral disc is not excised completely but remains in contact with the sclera in one place. Something like a little window is the result. When the magnet is brought up to the bared choroid the splinter often comes out by itself, cutting the retina and choroid. After removal of the fragment the scleral disc is put back in its place. No suture is placed in the sclera, only in the conjunctiva.

It should be emphasized that the diascleral method of splinter removal from the eye at present is no longer a method of choice, but the preferable method for splinters in the posterior region, especially when the lens is transparent.

The anterior method of splinter removal (in the sense of bringing the foreign body from the posterior part into the anterior chamber) is not ignored, but the sphere of its indications is limited.

For the correct application of our magnet—that is, for its diascleral application according to exact X-ray data—the incision of the sclera is made above the place where the foreign body is located and the distance between magnet and

splinter does not exceed 12 to 13 mm. This distance, in most cases, assures the removal of the splinter by our permanent magnet.

Exact roentgenolocalization, accurate transference of X-ray data onto the surface of the eye, convenient incision of the sclera, and the successful application

of our permanent magnet, which has a number of essential advantages over the electromagnet, can be achieved when it is necessary to perform the magnet operation in more or less primitive conditions, such as may often obtain in rendering aid in the war.

*Ufa, Zentsova 29.*

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# NOTES, CASES, INSTRUMENTS

## UVEOPAROTID FEVER WITH BILATERAL PAPILLEDEMA\*

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Because of its obscure etiology and bizarre manifestations, uveoparotid fever (Heerfordt's disease) has stimulated a great deal of interest and speculation. Associated with the uveitis and the parotid swelling are many neurologic disturbances including peripheral polyneuritis, facial paralysis, ptosis, diplopia, recurrent laryngeal paralysis, vagal paralysis, spasticity of the lower extremities, ataxia, deafness, numbness, and pares-  
thesia.<sup>1</sup>

However, we have been unable to find any reference to the presence of papilledema associated with the syndrome.

The following case is of interest, not only because of the presence of this unusual finding, but from the standpoint of differential diagnosis.

G. N. P., a white man, aged 24 years, was first seen on October 17, 1943, in the clinic, with complaints of malaise and generalized aching in all his joints. His temperature was 99.8°F., and a provisional diagnosis of influenza was made. The patient was given symptomatic treatment.

Nine days later he again came to the clinic, complaining of mild transient pains in the joints and lower extremities, without any objective findings. His temperature was 100.2°F. He was admitted to the hospital as having an undiagnosed fever. The physical examination was entirely negative, and the routine laboratory work revealed no abnormalities except

some soft infiltration at the right base in the chest film consistent with a mild persistent common respiratory infection. His course in the hospital was uneventful, the patient continuing to run a low-grade fever, and on the sixteenth hospital day a swelling of the right parotid gland was observed. This was attributed to the iodides he had been receiving. At the same time *Amoeba histolytica*, which had earlier been looked for without success, was found in the stool.

A few days later the left parotid gland became swollen. The distinctive feature of this parotid swelling was the lack of periparotid swelling, so that the parotid glands could be exceptionally well outlined by palpation.

On the twenty-ninth hospital day, the patient began to complain of redness and pain of the right eye. The ocular examination at this time revealed vision R.E. 20/30; L.E. 20/30. The results of external examination of the right eye were moderate conjunctival injection with slight ciliary injection. The pupil was slightly irregular, larger than the left, but reacted to light and accommodation; the media were clear; the disc showed definite blurring of the margin with two diopters of papilledema; no hemorrhage was seen; blood vessels were normal, except for some venous congestion, and the macula was normal.

Examination of the left eye revealed a clear conjunctiva and cornea, the pupil slightly miotic but reacting to light and accommodation; the media were clear; the disc was definitely blurred at the margin, with about two diopters of papilledema present.

A diagnosis of subacute conjunctivitis with possible iritis was made, with the

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note that uveoparotid fever must be considered; the cause of the papilledema was undetermined at this time.

The patient ran an irregular low-grade fever of 99 to 100°F. for 32 days of hospitalization. A neurologic examination was devoid of any positive findings other than the bilateral papilledema. Skull X-ray studies were negative. The patient was sent to a nearby Army Station Hospital for further study of the spinal fluid. The spinal pressure was 90 to 100 mm. water; there were 39 cells, of which 32 were lymphocytes and 7 polymorphonuclears. The total protein was 130 mg. percent.

While the patient was at the Army Hospital, definite evidence of iritis developed in the right eye. There were a few small posterior synechiae and a slightly cloudy aqueous. The patient was treated with atropine and hot compresses, and reentered our hospital on December 13, 1943. The ophthalmologic examination at this time was: Vision, R.E. with pinhole disc, 20/50; L.E. with pinhole disc, 20/30. The right eye was semi-dilated, with a posterior synechia at the 11-o'clock position. There were definite ciliary injection and marked vitreous opacities in the right eye. It was still possible to see the fundus, and there had been no change in the papilledema of the disc of that eye.

Examination of the left eye at this time revealed definite ciliary injection; the media were clear, and fundus findings as previously noted. Because of the definite evidence now of bilateral uveitis and a persistence of the parotid swelling, the diagnosis of uveoparotid fever was made.

The patient was sent back to the United States and was followed in New York City by Dr. Townley Paton and in Baltimore by Dr. Frank B. Walsh. Both men agreed with the findings and diagnosis. The following note was received from

Dr. Walsh, who saw the patient about two months after he left our care.

"When I saw him the visual acuity was 20/70 O.D. and 20/40 O.S. The slitlamp examination of the right eye revealed deposits on the posterior surface of the cornea and what I took to be Koeppe's nodules about the pupillary margin; the ray was positive. The left eye was essentially similar with an aqueous ray only faintly positive. Ophthalmoscopic examination of the right eye showed many fine and a few heavy vitreous opacities, a blurred nerve head without measurable edema, clear macula, disseminated lesions of chorioretinal atrophy in the lower fundus, temporally and above, many of the lesions being situated along vessels. There were floating opacities in the vitreous of the left eye; the disc margins were blurred above and below, but there was no measurable edema. The macula seemed clear. Far below the disc there was a whitish mass one half the size of the disc with margins which were becoming demarcated; above this there were several such smaller masses in the temporal fundus. In the upper temporal fundus there was a single small mass, and the upper nasal fundus seemed quite clear."

The results from the laboratory work done agreed with the findings at our hospital. In addition, other tests for brucellosis were negative. Word recently received from the patient (August 15, 1944) stated that he had stopped using atropine in his eyes, and that his vision had now improved to 20/20 in both eyes. There is no ophthalmologic report available since that done by Dr. Walsh.

The family history and past history were not significant except for the fact that there was no family history of tuberculosis and the patient had mumps as a child.

Laboratory procedures gave the fol-

lowing results: Hemoglobin, 16.0 grams and red blood cells 5,040,000. The white-cell count varied between 6,900 and 9,600 on several occasions, with a normal differential count except for an eosinophilia of 5 percent and 8 percent on two occasions. Two blood-sedimentation-rate values were 4 and 7 mm. per hour. Urinalyses were entirely negative. The blood Kahn reaction was negative, as was the Mantoux test. Agglutinations for *E. typhi*, Para A and B, and *Brucella* were negative. A few trophozoites and many cysts of *Endamoeba histolytica* were found in the stool examination, but after treatment three negative stools were obtained. Examination of the spinal fluid on November 20, 1943, revealed normal pressure, 39 cells per cubic centimeter, of which 32 were lymphocytes, and a total protein of 130 mg. percent. Repeat examination on January 17, 1944 revealed 5 lymphocytes per cubic centimeter, a total protein of 86 mg. percent, and normal pressure. X-ray film of the chest on November 3, 1943, revealed a small density along the right heart border, consistent with pneumonitis.

#### COMMENT

The etiology of uveoparotid fever is still unknown. Probably the best accepted theory is that the disease is due to an unknown toxin which affects the parotid and uveal tissue, producing tuberculous-like nodules. The main controversy is whether or not it is due to tuberculosis. It is noteworthy that the tuberculin skin test was negative in this case.

The close relationship between uveoparotid fever and sarcoidosis was shown by Walsh.<sup>2</sup> He concluded that these two conditions were closely allied and would probably be proved tuberculous in origin. It might be of interest to note that Reis and Rothfeld<sup>3</sup> reported a case of sar-

coidosis in a 17-year-old girl with bilateral papilledema.

The question arises as to whether or not this case should be classified as optic neuritis or papilledema. Pathologically in optic neuritis two processes are taking place—proliferative changes in the interstitial tissue followed by degenerative changes in the neural tissues. There is marked edema and invasion of inflammatory cells with thickening of the connective-tissue septa.<sup>4</sup> If the process occurs near the distal end of the nerve, swelling of the disc results. Clinically in optic neuritis the first findings are reduced visual acuity, and pain either in the eye or on movement of the eye. Usually present is an involvement of the papillomacular bundle, with a resulting central scotoma. It is not uncommon to find in the posterior vitreous a haziness caused by fine opacities. None of these conditions was present in the case we are presenting.

Pathologically in papilledema there is simple edema of the nerve head, with edematous swelling of the nerve fibers and an infiltration of all the tissue with fluid.<sup>5</sup> The presence of inflammatory changes is rare, and any change present is probably secondary to degenerative changes in the nerve. Any loss of function of the nerve occurs late in the process. These changes are possibly due to an obstruction in the venous drainage of the optic nerve, resulting in disturbance in the metabolism, and causing a derangement in the normal traffic of the tissue fluids.<sup>6</sup> Such a venous obstruction could have been caused in our case by a plastic meningeal process along the superior orbital fissure and optic foramina in a manner analogous to that observed in luetic optico-chiasmic arachnoiditis. Such a process would produce the spinal-fluid findings of increased protein and increase in cells<sup>7</sup> without necessarily producing an

increase in intracranial pressure.

Another explanation of the swelling of the nerve head associated with spinal-fluid findings of meningeal involvement must be considered. If a plastic meningeal process were present in the region of the optic foramina this process could extend through the foramen and involve the meningeal coverings of the intraorbital portion of the optic nerve. Such a course of events could explain both the optic-nerve and the spinal-fluid findings. If the edema of the nerve head were due to inflammatory involvement of the sheaths of the optic nerve, one might expect that after more than six months of involvement there would be a spread of the inflammatory process into the nerve itself, with permanent loss of the peripheral visual field. Such was not the case with the patient under consideration.

The edema of the optic nerve discovered in this case of uveoparotid fever we believe to have been caused by a localized patch of meningitis in the region of the superior orbital fissures. This meningitis would explain the increase in protein and cellular content of the spinal fluid. The passive edema would also account for the good visual acuity and field which were present when the papilledema was first discovered before the uveitis developed.

Until the uveitis developed in this case, the bizarre history and findings produced a great problem in differential diagnosis.

The low-grade fever was at first thought to be due to a small pneumonic patch revealed by the X-ray study of the lung. Iodides were given, and coincidental with this the parotid swelling developed. The fact that the parotid swelling was so discrete with no periparotid involvement, and the long duration of the parotid swelling, associated with the subsequent uveitis, definitely ruled out the iodides as a cause of the parotitis. The next confusing finding was the presence of *Endamoeba histolytica*, trophozoites, and cysts in the stool, associated with a history of having been in the Near East. Subsequent negative stool examinations, and no other symptoms referable to amoebiasis, aided in eliminating this as a factor. A final diagnosis of uveoparotid fever was made because of the history of low-grade fever and general malaise, followed by bilateral parotid swelling, which, in turn, was followed by a bilateral uveitis.

#### SUMMARY

An interesting case of uveoparotid fever complicated by bilateral papilledema was presented. The patient first complained of general malaise, which was followed three weeks later with bilateral parotitis. This was subsequently followed two weeks later by the appearance of bilateral papilledema. The uveitis became fully developed about two weeks after the papilledema was discovered.

700 Roosevelt Building.

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## METASTATIC CARCINOMA TO THE CHOROID ARISING FROM THE LIP\*

EDWARD GOODSITT, M.D.  
*East Cleveland, Ohio*

Metastatic tumors to the eyeball are uncommon. Willis<sup>1</sup> and Usher<sup>2</sup> in their extensive studies of this condition mention its rarity, and in one series of approximately 100,000 admissions to an ophthalmic hospital only one such case was seen. The tumor occurs most frequently in the fifth decade of life and approximately 75

average length of life after its occurrence is approximately eight months, the longest two years, the shortest one month. In the majority of cases, the condition is associated with metastases to the nervous system and frequently with extensive metastases throughout the body. In some cases there may be a long interval between the treatment of the primary growth and the development of ocular metastases. The tumors most frequently involve the choroid but are occasionally seen in the ciliary body and iris. These new growths present a characteristic pathologic change, arising most frequently in the posterior half of the eye, enlarging rapidly, and extending forward sometimes to involve the ciliary body. They are discoid or plaque-like, spreading along the choroid, replacing it and lifting the retina above it. The tumor may extend into the choroidal blood vessels and backward along the optic nerve. Involvement of the sclera is rare. Ophthalmoscopic examination shows a progressively enlarging, flat, gray or mot-

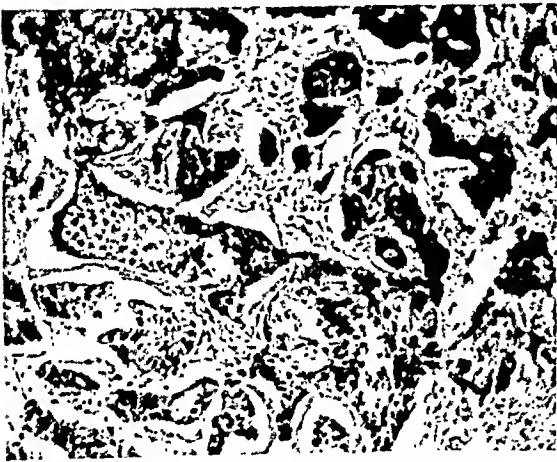


Fig. 1 (Goodsitt). Primary squamous-cell carcinoma of upper lip.

percent of the cases occur in females. The youngest patient in the series of Usher was 20 and the oldest 72 years of age. The site of the primary tumor in over half the cases in females is the breast. In males the most common site of origin is the lung. A few cases have been reported as originating in the stomach, thyroid gland, liver, kidneys, esophagus, and colon. In approximately one third of the cases the metastases involved both eyes. The presence of metastases to the eyeball, particularly the choroid, is a grave sign. The



Fig. 2 (Goodsitt). Low-power section of eye showing metastasis to choroid and tumor thrombus in vein.

\* From the Department of Pathology, Huron Road Hospital.

tled swelling in the posterior portion of the fundus covered by retina, which is displaced forward. The usual symptoms are blurring of vision, with ill-defined scotomata due to displacement of the retina. Clinically, the tumor can be differentiated from primary tumors by the ophthalmoscopic appearance and also by the history of primary tumor in another part of the body. The case presented here

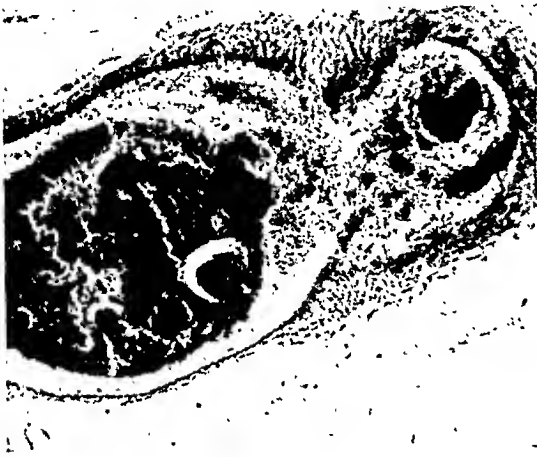


Fig. 3 (Goodsitt). High-power view of tumor thrombus in vein.

is unusual in having as the primary site a squamous-cell carcinoma of the inner surface of the upper lip removed approximately three years before the development of the ocular metastasis.

#### CASE REPORT

A white man, aged 48 years, was admitted on March 6, 1941, complaining of a swelling on the right side of the neck under the mandible. Here, there were two tumors, the larger approximately 4 cm. in diameter. There was also a growth on the inner surface of the upper lip. This was hard, approximately 3 cm. in diameter, and flat. The remaining history and physical examination were irrelevant. The primary tumor of the lip and the lymph nodes in the neck were excised. The report of pathology was squamous-cell car-



Fig. 4 (Goodsitt). Tumor in region of optic nerve, showing sharp limitation at nerve.

cinoma of the lip with metastases to the cervical lymph nodes. The patient was discharged four days later in good condition.

He reentered the hospital on September 23, 1941, presenting a painless tumor mass on the left side of the neck of three-weeks' duration. This tumor was similar to the one previously removed. It meas-



Fig. 5 (Goodsitt). Tumor invading choroid.

ured  $2\frac{1}{2}$  cm. in diameter, and was hard and fixed. There were no apparent abnormalities of the eyes at this time. This mass was removed and proved to be a metastatic squamous-cell carcinoma in the cervical lymph nodes. The patient was readmitted on November 27, 1942, because of a recurrence on the right side of the neck. A block dissection of these nodes was performed and again squamous-cell carcinoma was found. At this time there was no apparent abnormality of vision.

On February 22, 1944, he was again admitted, complaining of blurring of vision of the right eye, of approximately 6-weeks' duration. There was no pain. The vision had become progressively worse. Examination showed the right eye miotic, with extensive edema of the nerve head. The eye was enucleated, and 40 mg. of radium was implanted into the orbit for six hours. The patient made an uneventful recovery from this operation and was discharged in good condition.

Examination of the enucleated eye resulted in the following pathologic report:

Specimen consists of an eyeball measuring 21 mm. in the vertical diameter, by 22 by 22 mm., is of average size and well shaped, showing the cornea 11 mm. in diameter and transparent. The pupil measures 4 mm. in diameter, and is centrally placed. On the posterior surface, the nerve is present for a distance of 5 mm., 4 mm. in diameter, with some thickening of the nerve sheath. On section, the anterior surface shows nothing of importance. The lens is of average size, and transparent. There are no abnormalities of the ciliary body. The posterior portion of the eyeball shows the retina pushed forward by translucent gray tumor tissue 1 to 2 mm. in thickness, apparently replacing the choroid, extending radially from the optic nerve head approximately 8 to 10 mm. on all sides of the optic nerve. The retina is not detached. The sclera is

of approximately average thickness, firm, and pale gray.

*Microscopic description.* Sections of the eye taken from the ciliary region show no evidence of tumor or other abnormalities. Sections taken from the region of the posterior portion of the eye and the optic nerve show the retina to be of average thickness, with the layers intact and well defined. The choroid is replaced by tumor tissue, with a few strands of brown-pigmented tissue present in places around the new growth and in places extending between the tumor masses, apparently the remains of the choroid. A few compressed blood vessels are noted in this area. The tumor lies within the choroid layer, touching both the retina and the sclera, and consists of irregular solid masses of large polyhedral cells with large vesicular nuclei and a few mitotic figures. Masses of tumor tissue are seen within vascular channels, and in one section a blood vessel in the sheath of the optic nerve contains a mass of tumor tissue. *Final diagnosis:* metastatic squamous-cell carcinoma in choroid layer of the eyeball.

Approximately one month later the patient developed skin nodules over the right lower abdomen and died approximately three months after the operation on the eye.

#### SUMMARY

A case of metastatic squamous-cell carcinoma to the choroid of the eye is presented. Metastasis to the eye is unusual and very few cases of squamous-cell carcinoma have been seen. The metastases developed approximately three years after the primary tumor had been diagnosed. The clinical and pathologic picture due to the lesions of the eye are characteristic of other cases reported, with typical involvement of the choroid. The patient died within three months of the enucleation of the eye.

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## REFRACTION CLINIC\*

DISCUSSION BY ALBERT E. SLOANE, M.D.<sup>†</sup>  
*Boston*

A man, aged 44 years, had worn the same prescription for glasses for 10 years. The prescription found was exactly the same as the glasses he was wearing. He complained that it was difficult for him to read a newspaper with his glasses. Our examination revealed the following data:

Vision with either eye was 20/200. It was improved to 20/20 O.U. with the following correction: R.E. -2.50D. sph.  $\ominus$  -0.25D. cyl. ax. 90°; L.E. -2.50D. sph.  $\ominus$  -0.25D. cyl. ax. 90°.

Distance	{	2 <sup>A</sup> Exophoria
		1/2 <sup>A</sup> Hyperphoria
Near	{	4 <sup>A</sup> Exophoria
		Orthophoria

## DISCUSSION

The symptoms of which the patient complained are typically those of early presbyopia. The fact that his distance glasses have not changed in a number of years is not unusual, since myopia of this amount is generally unprogressive and remains approximately the same after full maturity is reached. The muscle-balance findings are well within normal limits and do not contribute to the symptomatology. The problem in this case is reduced to deciding how the near-vision difficulty can best be solved.

## SOLUTION

There are two choices: First, a prescription of the near glasses of approxi-

mately +1.25D. sph. added to his present glasses. The other solution would be simply to remove the glasses and allow the patient to read with his naked eyes. This decision would be greatly influenced by the occupational demands on his eyes. For example, if he were employed in such a way that it would be inconvenient for him to keep putting on or taking off his glasses, bifocals would be necessary. On the other hand, if his occupation did not require this, it would be better for him to use no glasses for near. It is true that without his glasses his far point is brought to 16 inches, which is a little close for ordinary near work. On the other hand, he would enjoy vision that is not limited to the segment of his bifocals, and a larger retinal image without any accommodative strain. In most instances such patients do best with single-vision distance glasses, and no glasses for near work. Where bifocals are necessary for near, it is well to prescribe them only to be used at work, but the patient may remove his glasses for prolonged reading.

Sometimes it is necessary to prescribe a single-vision near glass; in this case, for example, -1.25D. sph.  $\ominus$  -.25D. cyl. ax. 90°, which would have the advantage of giving good near vision and yet not cut down distance vision as much as it would be without glasses.

It may be stated that the myopic are more tolerant of a close near point than are hyperopics, thus justifying stronger additions even to the point of removing their glasses.

## QUESTIONS

House Officer: Supposing that this was an acquired myopia due to tumescence of

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the lens in a person 60 years of age, how would you handle it?

Dr. Sloane: I would tell this person that any glass prescribed for him now would not be permanent, nor could one predict how long it would be serviceable; and then I would prescribe the afore-described lens for distance and allow him to read either without glasses, or, if necessary, add plus spheres to give him still larger retinal images. In this case he would require no glasses for near.

H.O.: Assume that this person were given bifocals with a +2.50D. sph. addition so that the reading portion would parallel wearing no glasses at all. Does the patient see as well as without glasses?

Dr. Sloane: Although the optical effect is practically zero, the patient sees better without glasses at near.

### A SIMPLE RUBBER FORM FOR THE RECONSTRUCTION OF A CONTRACTED SOCKET\*

LORAND V. JOHNSON, M.D.  
Cleveland, Ohio

For some time, I have been using a form, trimmed from the end of an ordinary ear syringe, in the reconstruction of a contracted socket. It works so well that I am prompted to invite its trial by others, who probably, like myself, have

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been annoyed when trying to remove a single molded form, or finding that a bivalved form has slipped.

The central hole allows for drainage, and a silk suture tied to the ridge facilitates removal in children. I like best an

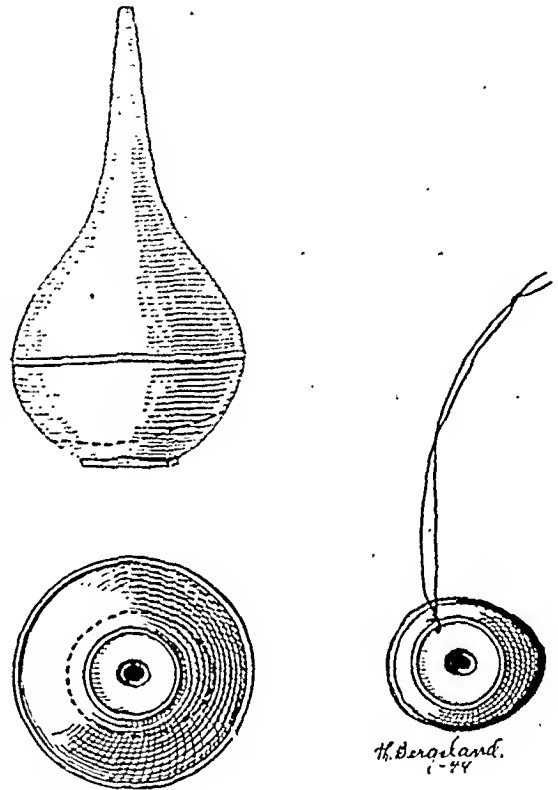


Fig. 1 (Johnson). Simple rubber form for reconstruction of a contracted socket.

old syringe that has been boiled repeatedly, since it is more flexible for inserting and removing. A little ointment on the inner side facilitates the spreading of the skin graft, and the form is easily inserted by compressing it with a large-toothed forceps. I have seldom been able to get such a large socket with a rigid form.

# SOCIETY PROCEEDINGS

EDITED BY DONALD J. LYLE

## NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

November 6, 1944

DR. MILTON L. BERLINER, *presiding*

### PATHOLOGIC ASPECTS OF TUBERCULOUS UVEITIS

DR. JOSEPH IGRSHEIMER stated that tuberculosis can produce acute anterior uveitis in experimental as well as in human pathology. The tissue reaction takes place according to the immunobiologic condition of the organism. The inflammation may be very temporary and may be similar to the clinically so-called rheumatic iritis. Another variety of the fugitive type of reaction is the Gilbert-Koeppel nodule. Chronic uveal tuberculosis may appear in different forms. The caseating variety with large nodules is a rarity nowadays. More frequently there are smaller nodules which develop, disappear, and reappear during the course of a chronic uveitis. The Koeppel nodule is not pathognomonic and may be seen also in syphilis, leprosy, and sympathetic ophthalmia.

Pathologic studies yield data on the relationship between tuberculous infection and chronic, uncharacteristic uveitis: (1) The tuberculous focus often lies in the ciliary body or in the root of the iris, whereas the visible iris shows only an uncharacteristic inflammation. The clinical appearance is not characteristic because the ciliary body most often is involved. (2) Occasionally hidden foci in the retina or in the vitreous near the retina have been found without specific inflammation of the anterior uvea at the time of enucleation. When visible clinically, such foci are whitish or bluish-

white in color. (3) The longer the course of the uveitis, the more likely it is that there will be new-formed connective tissue, but even in old stages of uveitis with abundant neoformation of connective tissue, inflammatory foci of nodular character may be seated deeply within the globe. (4) Inflammation within the globe may be found in cases in which all irritation and redness of the eye have disappeared. (5) There are cases of certain tuberculosis in other parts of the body concomitant with uveitis in which the anatomic findings in the eye are not specific. (6) In rare instances a uveitis of uncharacteristic nature occurs with a severe, necrotizing tuberculosis of the retina and choroid.

### OCULAR TUBERCULOSIS. CLINICAL MANIFESTATIONS, DIAGNOSIS, PATHOGENESIS, AND TREATMENT

DR. ALAN C. WOODS listed the various clinical manifestations of ocular tuberculosis: (1) Conjunctivitis. (2) Keratitis: (a) phlyctenular keratitis, (b) sclerokeratitis, (c) interstitial keratitis, (d) deep, central keratitis, (e) tuberculous infiltrates of the cornea, and (f) ulcerative keratitis. (3) Tuberculous disease of the anterior uvea: (a) simple iritis, (b) nodular iritis, and (c) conglomerate tuberculoma. (4) Tuberculous disease of the posterior uvea: (a) circumscribed recurrent lesions, (b) acute caseating lesions, (c) miliary lesions, (d) solitary tubercles, and (e) tuberculoma. (5) Scleritis. (6) Tuberculosis of retina: (a) superficial type, and (b) Eales's disease. (7) Tuberculosis of optic nerve: (a) from tuberculous meningitis, and (b) secondary to tuberculous periphlebitis..

The character of the lesions may vary.

They may be necrotizing and destructive, drawn-out uveitis, or evanescent lesions with focal reactions, as is seen in phlyctenules. These conditions are considered tuberculous because of the correlation of clinical findings with known pathologic material and because these lesions can be produced experimentally in animals. It is difficult to say whence they arise, as they are infrequent in cases with frank, open tuberculosis and are so commonly seen in healthy people with no tuberculosis or old healed lesions. They probably are for the most part of mediastinal origin, the lesion there rupturing into a vessel and lodging in the eye. The immunobiologic status of the patient determines the type of resultant lesion.

Diagnosis depends on four factors: (1) The clinical picture, which can be only strongly suggestive, as sarcoidosis or brucellosis may have the same appearance. (2) Elimination of other causal factors, and determining the effect of eradication of foci of infection. (3) Demonstration of other tuberculous foci either by physical signs or X ray, the total positive findings being 65 to 70 percent of all cases of ocular tuberculosis, which means, in other words, that many cases do not have a demonstrable tuberculous reservoir. (4) The tuberculin reaction, which must be performed with the use of high concentrations of tuberculin if the higher dilutions give no reaction. It must be remembered that ocular sensitivity does not equal cutaneous sensitivity, the latter possibly being low while the former may be great.

The pathogenesis of these tuberculous lesions varies. They may be caused by the actual invasion of the tissues by the tubercle bacilli, by toxic substances diffusing from a tuberculous focus, or by hypersensitivity of tissues to tuberculo-protein. The nature and course of the lesions after infection are dependent on

a balance of the following factors: (a) the number and virulence of the invading organisms, (b) the degree of hypersensitivity of the tissue, and (c) the degree of resistance or immunity.

Treatment may be considered from three aspects: (a) enhancement of resistance or immunity, as by general hygienic measures or repeated paracentesis; (b) direct attack upon the tubercle bacilli, looking toward their destruction or attenuation, by means of colloidal gold (which is not recommended), nonspecific-protein therapy, especially in early cases to pass the acute phase before tuberculin can be used, and phototherapy which in general has not been satisfactory; and (c) removal of fatal tissue sensitivity by the use of tuberculin according to the concepts of Rich. The tuberculin is administered for the purpose of desensitizing the tissues to tuberculo-protein and not to produce a perifocal reaction. It must be commenced in infinitesimal dosage which is gradually increased. If at any time a reaction occurs the dosage is markedly reduced. The administration of tuberculin must be maintained for a long period of time to continue the desensitization.

*Discussion.* Dr. Isadore Givner requested that Dr. George Ornstein discuss the use of diasone in the treatment of tuberculosis. He understood that it was a dangerous drug.

Dr. George Ornstein admitted that he had had one fatal case in his series treated with diasone but believed that henceforth there should be no fatalities. Evidence of reaction must be watched for, the most important being cutaneous and calling for immediate cessation of the drug upon its appearance. The blood and urine must also be watched and if these precautions are taken the drug is quite safe.

Dr. Milton Berliner asked whether there could be a specific organic heredi-

tary tendency for tuberculous infection. He said that in some quarters it is held that even part of an organ—for example, the iris—may be susceptible.

Dr. Ornstein stated that there is no hereditary factor of this kind in tuberculosis. Whenever the bacilli enter the body the disease is present. Statistics disprove the former belief that certain groups have an hereditary tendency to the disease.

Dr. Woods agreed with the statement by Dr. Ornstein that ocular tuberculosis does not occur without the actual presence of the tubercle bacilli in the eye. He took exception to the pronouncements of those ophthalmologists who speak of allergic tuberculous ocular disease, meaning that the allergic phase of the disease—namely, the acute inflammatory phase—is predominating in the clinical picture. One reason for the rarity of proof of the presence of tubercle bacilli in eyes having been regarded clinically as tuberculous is that when they have been removed they are rarely ground up and injected into guinea pigs. Instead they are sectioned and the difficulty of finding the bacilli in microscopic sections is well known. Experimentally, if the eyes of guinea pigs after recovery from induced ocular tuberculosis are enucleated, even after several years of apparent healing, and ground up and injected into guinea pigs, there will almost invariably be a positive take. On the other hand, upon sectioning these animals' eyes it is extremely difficult to find the bacilli.

Dr. Woods emphasized the fact that when tuberculosis is produced in the eye, whether as a primary or secondary lesion, there may be a local development of tissue sensitivity out of all proportion to the sensitivity of the body as a whole.

Leon H. Ehrlich,  
*Secretary.*

## LOS ANGELES SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

November 27, 1944

### SIMPLE GLAUCOMA

DR. ETTA C. JEANCON discussed the factors involved in the diagnosis of chronic simple glaucoma and the provocative tests now in use. Among others she mentioned the use of coffee, euphthalmine, large quantities of water, and sitting in a dark room. She then projected the visual fields and discussed the case histories of 28 patients, and pointed out how the diagnosis had been missed or might have been missed in these cases. Dr. Jeancon took a conservative attitude in relation to surgery. She believed many of these people could be carried along for many years by judicious use of miotics.

*Discussion.* Dr. C. H. Albaugh mentioned that occasionally euphthalmine may be a dangerous drug. He cited a case that had been seen by Dr. Allan Greenwood in Boston. The patient developed an attack of acute congestive glaucoma following one drop of euphthalmine. Dr. Albaugh also referred to a similar case from his own experience.

In reply Dr. Jeancon wished to state that she did not advocate the use of euphthalmine as a provocative test but merely mentioned it to include it as one of those in current usage.

### PATHOLOGY OF SIMPLE GLAUCOMA

DR. MAURICE N. BEIGELMAN pointed out that because so few cases become available for pathologic study when glaucoma is in its early phases, much about the early pathology of chronic simple glaucoma is unknown. He stated that to his knowledge there were only three such cases reported in the literature. These showed abnormal processes only in the

optic nerve. Dr. Beigelman described some of the terminal phases of simple glaucoma, such as the absence of muscle fibers in the sphincter muscle of the iris, which he felt makes it unlikely that miotics would be of much benefit. Furthermore, the vessels in the eye have become sclerotic and recurrent hemorrhages frequently are seen. He said that one of the causes for uncontrolled intraocular pressure following surgery is that there is an incarceration of uveal tissue in a trephine wound, usually of ciliary processes which move forward into the opening.

His recommendation was that early surgery be done before these terminal structural phases have an opportunity to present themselves.

C. H. Albaugh,  
*Reporter.*

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## ANNUAL MEETING OF THE DEPARTMENT OF OPHTHALMOLOGY, THE GEORGE WASHINGTON UNIVERSITY SCHOOL OF MEDICINE

December 2, 1944

DR. ERNEST SHEPPARD, *Executive officer*  
Washington, D.C.

### OPHTHALMIC INJURIES INCIDENT TO WAR

COL. JOHN L. MATTHEWS (MC), School of Aviation Medicine, Randolph Field, Texas (by invitation), stated that ophthalmic injuries caused by "blast" of high explosives, in the atmosphere or in water, have increased in the present war. The pathologic picture produced by the two is essentially similar; retrobulbar hemorrhages, retinal and choroidal ruptures, cataracts, and dislocations of the lens. Lesser damage includes "traumatic keratitis," rupture of Descemet's mem-

brane, and transient opacification of the substantia propria of the cornea.

Intraocular foreign bodies are most frequently of low magnetizability. Several ingenious methods of X-ray localization have been devised for use under field conditions.

Penicillin is of value in the handling of ocular perforations.

Macular burns from solar exposure are being reported among personnel stationed in the tropics.

The pathology and treatment of lesions due to chemical-warfare agents were briefly reviewed.

### PARTIAL PENETRATING KERATOPLASTY

MAJOR JAMES SPENCER DRYDEN (MC) (by invitation), demonstrated partial penetrating keratoplasty on rabbits' eyes and made a preliminary report on his experiments. Major Dryden will report his findings in full later.

### A FOREIGN BODY IN THE LACRIMAL SAC

DR. FRANK D. COSTENBADER presented a paper on this subject which has been published in this Journal (July, 1945).

### CORNEAL DYSTROPHY WITH INCREASED OCULAR TENSION

DR. STERLING BOCKOVEN presented the case of Mrs. E. P., aged 46 years, seen for the first time on August 20, 1943. The cornea of the left eye was steamy. The corrected visual acuity was 20/100. The pupil was dilated in the routine examination, following which the tension was 30 mm. Hg (Schiotz); this was lowered with eserine. The cornea was more steamy as the tension rose to 30 mm. again and became less so as the tension decreased. Pilocarpine was prescribed, and on August 24, 1943, the corrected vision was 20/70. The cornea remained somewhat cloudy and this involved the deeper layers. The anterior chamber was shallow and

there was a congenital defect in the iris.

On January 21, 1944, a trephining was performed. This lowered the tension but it rose again, and on March 24, 1944, another trephining was performed. Following this the corneal epithelium broke down repeatedly with numerous staining areas. The medication included pilocarpine drops; denatured bacterial antigen, hypodermically; and riboflavin and vitamin B, by mouth.

A complete physical examination revealed no systemic pathology and the diagnosis of corneal dystrophy with increased ocular tension was concurred in.

The tension remained high, and on September 24, 1944, a cyclodiathermia was performed. On October 16, 1944, the tension was 15 mm., and there was some wrinkling of Descemet's membrane and a general roughening of the corneal epithelium. When last seen the patient was using homatropine drops, riboflavin, and vitamin A.

*Discussion.* Dr. C. R. Naples said that this particular type of corneal haziness, due to prolonged increase of intraocular pressure, does not disappear when the intraocular pressure is relieved. In this type there is a definite edema, due to the impediment which prolonged pressure causes to the diffusion of lymph. Fluid accumulates between the lamellae and around the nerve fibers.

There was also an atrophy of the iris and ciliary body, most likely following the cyclodiathermia, which was the only procedure that seemed to lower the tension.

Dr. Ronald Cox said he did not think that the corneal condition which Dr. Bockoven's patient had, was a true dystrophy. He did not know whether a cornea could be perfectly normal for 40 years and then develop a true dystrophy, such as Vogt's dystrophy. He believed that the corneal nebulae in this case were

a result of the chronic glaucoma. Perhaps this is an academic differentiation, but to him this was not a dystrophy *per se*.

Dr. Leonard E. Goodman said he would like to have Dr. Bockoven describe the type of diathermy and the technique he used on this patient.

Dr. Frank D. Costenbader said that this patient had a low-grade increase in tension combined with corneal opacity and some associated epithelial bullae. He did not believe this was a true case of corneal dystrophy, as it is usually understood, but that the low-grade tension combined with some damage to corneal endothelium rather completely accounts for the whole picture. Patients who had congenital glaucoma (buphthalmos) in which the tension was not much increased have been seen, but the cornea was steamy due to a rupture in Descemet's membrane. As soon as this moderate elevation in tension has been relieved by paracentesis, the cornea clears. Also cases have been seen in which very satisfactory cataract extractions were done but the anterior chamber failed to re-form, the vitreous or iris was adherent to the posterior surface of the cornea, endothelial damage took place, and increase in pressure occurred. In other words, the very moderate increase in tension plus damage to the endothelium, could well explain the whole picture in this case.

Dr. Sterling Bockoven, in closing, said that he placed too broad a meaning on the term dystrophy. There may have been some damage to Descemet's membrane, with some infiltration into the stroma of the cornea. Then with the reduction of the tension the edges of possible tears would be brought together and less fluid could get in, with resultant clearing of the cornea. The fact that there is some atrophy of the iris along with the glaucoma made one think that the eye had not been normal for some time.

In the cyclodiathermia he made a wide conjunctival flap and made multiple diathermic punctures into the ciliary body. He included the upper half, and made about 12 punctures. The regular Walker unit was used.

#### PULSATING EXOPHTHALMOS

DR. RONALD COX presented R. C. E., a Negro, aged 52 years, who was thrown from a swiftly moving motorcycle on September 26, 1944. He was thrown against a post and knocked unconscious. He remained in this condition for two weeks during which time X-ray examinations showed that he had a fracture "across the middle of the petrous portion of the sphenoid bone."

Upon regaining consciousness, he was annoyed by a buzzing in the left ear, which persisted day and night. He also noticed that the left eye bulged forward somewhat, and that the vision was quite dim.

During the next week the left eye became more proptosed and bloodshot and vision disappeared completely. The eye was then so exophthalmic that the lids could not close over it, and the patient was sent to an ophthalmic clinic.

He was seen in the clinic for the first time on October 10, 1944, at which time the right eye was essentially normal. The vision of the right eye was 20/15. The left eye was proptosed 10 mm.

The eyeball showed marked chronic passive congestion, and the cornea was hazy and edematous. Ophthalmoscopic examination through the hazy media revealed atrophic pallor of the nerve head. There was a loud systolic bruit over the left side of the neck, and also over the upper lid of the left eye. A diagnosis of pulsating exophthalmos was made, and the patient was referred for an arteriogram.

*Discussion.* Dr. Leonard Goodman said

this case was interesting because it brought to mind an unusual cause of proptosis. This patient also had a left facial paralysis. Apparently there was no aberration of smell or taste. He said when he was an interne he had had the pleasure of helping Dr. Harry Kerr operate on a patient who had a similar condition following an automobile accident. The common carotid was ligated in two stages, first partially, then completely. The object of the double operation was to allow time for adjustment of the cerebral circulation to avoid paralysis or a fatal termination. About 10 percent of the patients who undergo ligation of the common carotid die. As Dr. Cox mentioned, these cases may not always be traumatic in origin. The traumatic ones are easy to diagnose but if there is no history of trauma one must be on guard to think of arteriovenous aneurysm as a possible cause of the proptosis.

#### MUSCLE PARALYSIS—CASE REPORT

DR. ERNEST SHEPPARD illustrated the case of S. W., a man, aged 19 years, by motion pictures. The following diagnoses were made: paralysis of the left inferior oblique, paralysis of the right superior oblique, concomitant exophoria, and anisometropia.

The vision was R.E. 20/70, corrected to 20/20-2 with -1.25D. sph.  $\approx$  -.25D. cyl. ax. 75°; L.E. 20/200, corrected to 20/15-4 with -5.25D. sph.  $\approx$  -50D. cyl. ax. 120°.

Without correction the right eye was used for distance fixation and the left eye for near fixation.

The head was tipped to the left shoulder, rotated to the right, and depressed. An advancement of the right inferior rectus was performed by the late Dr. William Thornwall Davis, which resulted in a reduction of the right hyperopia from 30 to 4 prism diopters.

The diagnosis of paralysis of the left inferior oblique was based on limitation of motion of the left eye in the upper nasal field, overaction of the right superior rectus, secondary contracture of the left superior oblique, marked right hypertropia (plus vertical divergence) when the head was tipped to the right shoulder, and no hypertropia when the head was tipped to the left shoulder.

The diagnosis of paralysis of the right superior oblique was based on the limitation of motion of the right eye in the

lower nasal field, overaction of the left inferior rectus, secondary contracture of the right inferior oblique, marked right hypertropia when the head was tipped to the right shoulder, and no hypertropia when the head was tipped to the left shoulder. In this case the very marked right hypertropia when the head was tipped to the right shoulder was due to the summation of the effect of the vestibular reflex present in paralysis of these muscles.



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## THE EDITOR'S FAREWELL TO ARMS

Back on the job after three years of service with the Army, your editor finds himself once more in charge of the destiny of one of the finest and most influential ophthalmic journals in the world. Emerging from another life which was exciting, challenging, and stimulating, he is amazed to find that during these long bitter years of warfare, hardships, and shortages that encircled and gripped every civilian venture, the prestige of the Journal is enhanced, its circulation increased, its scientific contributions growing in quality and quantity, and the number of its friends

and collaborators nearly double that of prewar years.

This extraordinary phenomenon appears at first sight to be a paradox. When one looks more deeply beneath the surface, however, one sees the cause. It is that of magnificent loyalty and team work of the entire staff under the experienced and wise guiding hands of the former editors, Dr. Post and Dr. Crisp.

With his usual modesty, Dr. Post, in a previous editorial, justly lauded the faithful members of the staff, effacing himself and minimizing his leadership. It is time to get the record straight and pay proper honors to the former chief-editor,

who stepped back into the vacuum without hesitancy at a time when his other responsibilities had increased almost beyond endurance, and 40 hours of work had to be accomplished in 24. Each number of the Journal during the war is a glowing witness to his wisdom and ability and to his burning interest in the welfare of ophthalmology. Each number, too, is a witness to the devotion of the staff under his brilliant direction. No more needs to be said. The record stands for all to see, and all of us are grateful.

We are grateful, too, to Dr. Crisp for his work during these years. At a time in his life when with honor and laurels he might have turned over to other hands the arduous task of editing abstracts of ophthalmic literature much of which was difficult of access, he continued on with increased vigor and will, because he was indispensable, and the Journal would have sustained a grievous wound by his resignation. For over a decade his editorials, faithfully appearing in these columns, have guided and helped ophthalmologists the world over. Those of the war years were particularly helpful, for they breathed wisdom and stability at a time when fiery chaos was everywhere.

It is good to be back among people such as these.

Derrick Vail.

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## BLINDNESS FROM ONCHOCERCA

Trachoma is still the world's greatest cause of blindness. But as a common disease it has receded from many civilized areas, and it has shown itself more and more susceptible to various forms of treatment. There is another cause of blindness which is estimated to affect more than a million persons throughout the world, and yet which is hardly known by name to most ophthalmologists. This

disease, onchocerciasis, although its causative agent is well understood, is essentially incapable of treatment by any known remedy. Furthermore, the possibility that this disease may ultimately affect civilized populations to which it is at present unfamiliar is by no means to be excluded.

Human ocular onchocerciasis is widely endemic in many African areas of the British Colonial Empire, and has been found widespread in southern Mexico and Guatemala. It is due to infestation with the microfilarias of a threadworm, *Onchocerca*, which invade almost all parts of the eye and lead slowly to complete blindness from corneal opacities, cataract, chorioretinal degeneration, and optic atrophy. An investigation of its incidence in the Gold Coast of equatorial Africa has recently been made by Harold Ridley, of the Royal Army Medical Service (*British Journal of Ophthalmology*, Monograph Supplement X, 1945) who laments that lack of realization of the importance of the disease was demonstrated by absence of mention at a discussion held in London in 1944, on "Important diseases affecting West African troops."

In Africa, research has attributed the disease to a filaria named "*Onchocerca volvulus*"; while in Guatemala the responsible parasite is called "*Onchocerca caecutiens*" ("the blinding filaria"). The two organisms are presumably identical, and there is a probability that the disease was primarily African and was originally imported to the Americas with the slave trade. The disease is carried by the fly *Simulium*, which breeds in running water at altitudes from sea level to 4,500 feet. *Simulium* is an intermediate host. Man is the true host of this filaria, since he carries the organism during its sexual stage.

Much work on the subject has been done by Pacheco-Luna of Guatemala. At the Cleveland Pan-American Congress, Pacheco-Luna showed some remarkable

cinematographic film illustrating the life activity of the microfilaria.

Ridley suggests a distinct possibility that the disease may spread to temperate climates. Twenty-nine cases of onchocerciasis have been recorded in Europeans, although only four of these patients had ocular lesions. Adequate clothing provides more or less protection, but Ridley thinks that British soldiers who served in Africa may show the disease after the war. It is estimated that an area of about five million square miles of the earth's surface, with a population of something like one hundred million, is exposed to the disease.

There are many varieties of onchocerca, all being ovoviviparous threadworms. Clinically, the primary manifestation of the adult onchocerca takes as a rule the form of subcutaneous nodules. The life history includes four stages: the adult, the egg, and the microfilaria, all found in man, and the larva, found in insects, chiefly the fly *Simulium*. The adult organism inhabits the subcutaneous nodule, in which the eggs are produced and hatched.

The American variety of the fly *Simulium* is said to bite the human victim about five feet from the ground and therefore rather commonly on the head. Like certain snakes, the saliva of this fly contains an anticoagulant. The insect sucks blood for one and a half to five minutes, and, once having begun to suck, can continue to do so even under water.

The subcutaneous nodules which develop as a result of human infection range in size from "that of a pea" to an inch or more in diameter. In a case seen in Africa by Strong (quoted by Ridley) there were 150 of these nodules, although nineteen was the largest number of nodules discovered in any of the cases studied by Ridley.

Ocular involvement is thought to be

more likely when the nodules are close to the eye, although the site of the nodule has no definite connection with that of the original bite. Nettel (see *American Journal of Ophthalmology*, 1945, volume 28, page 1061, and second abstract, page 1062) who gives careful instructions for study of skin lesions, considers that the principal and most frequent route by which microfilarias reach the eye is through the skin of the lids by way of the palpebral conjunctiva. Other organisms probably reach the region of the eye by way of filarial nodules deeply situated at the base of the skull.

In most of the cases in which the eye is infested, the cornea is involved. Only very gradually do ocular symptoms develop, the early manifestations being lachrimation and photophobia. In later stages the conjunctiva is thickened and has a "marbled appearance." The typical appearance of the cornea progresses from tiny circular opacities in the stroma, most commonly in the interpalpebral area, to a frosted appearance in the lower third of the cornea.

Apparently the corneal opacity is not produced until after the death of the microfilaria. Torres Estrada (*American Journal of Ophthalmology*, 1945, volume 28, page 1063) emphasizes the striking fact that, as the lesions of the disease pass from the microscopic to the macroscopic phase, the microfilarias gradually diminish in number, so that when blindness has developed it is extremely difficult to find even a few parasites in microscopic sections.

It must be remembered that the microfilaria is seldom more than 0.3 mm. in length. Only once in more than one thousand examinations did Ridley see a living microfilaria struggling in the corneal stroma. Next day the worm was dead, and in about a week the typical opacity developed around the dead worm. Ulti-

mately the lower part of the cornea takes on the appearance of "a mass of chronically inflamed tissue."

Microfilarias are frequently seen swimming in the aqueous, the best place to begin to look for them being the lower nasal quadrant a little behind the cornea. They disappear after a few minutes exposure to the beam of the slitlamp, but reappear after exposure to subdued daylight.

Further ocular lesions include plastic iritis with posterior synechia, this condition being relatively mild and seldom in itself a cause of blindness; a mild serous type of cyclitis; complicated cataract; and important changes in the retina, described as "quite distinctive, the nearest approach being perhaps a hypothetical combination of choroidal sclerosis with retinitis pigmentosa. Typically there are one or more large and approximately circular areas of tapetoretinal degeneration many disc-diameters in size, situated posterior to the equator and generally extending to the disc margin. . . The retina is abnormally transparent and its pigment heaped into one or more masses."

The literature contains various descriptions of microfilaria as seen in the conjunctiva, cornea, and vitreous. The most successful method of diagnosis of ocular involvement is said to be by snipping off a small piece of bulbar conjunctiva with forceps and scissors, under cocaine anesthesia, examination of the fresh, unstained specimen being then made with the low power of the microscope, in normal saline solution and beneath a cover glass.

Zoology and botany present numerous instances of the migration of an organism to new environment where it takes on the proportions of a plague. It seems reasonable to assume that such migration is responsible for various common infestations of the human body, and that such migrations will in the more or less distant

future create new disease and public-health problems for solution by medical science.

W. H. Crisp.

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## BILL TO ESTABLISH AN OPTOMETRY CORPS IN THE MEDICAL DEPARTMENT OF THE U. S. ARMY

Under the sponsorship of Congressman Dewey Short of Missouri, hearings on a bill to establish an optometry corps in the Army Medical Department were held by the Committee on Military Affairs of the House of Representatives from June 28 to July 9, 1945. This bill, in its original form, contained many features that were objectionable from every viewpoint except that of the optometrists. These individuals presented a militant, organized, and united attack. They were prepared and aggressive. They employed the same noisy tactics that they have so often used in the past in order to get their schemes through the various state legislatures. Letter writing, affidavits, and telegrams to the members of the Committee and other Congressmen played a major role in their campaign. A campaign of which, incidentally, few of the members of the medical profession are aware.

The bill in its original form (H.R. 1699) was modified as the result of the hearings. In spite of these changes the bill is still strongly opposed by the Secretary of War, the War Department, the Air Surgeon, and the Surgeon General of the Army. It is now known as H.R. Bill number 3755, has passed the House and has been submitted to the Military Affairs Committee of the Senate for action.

It is important to bear in mind the dates of this hearing. V-J Day had not yet arrived. The country was still at war, the end of which could not be foreseen. It

shows to what extent and with what selfish vigor the optometric groups will go. The time of this important congressional committee and that of the War Department, the offices of the Surgeon General and Air Surgeon were tied up for several weeks in the gathering of statistics and figures and the preparation of statements and in the actual hearings. Urgent and more important matters vital to the actual war effort and necessary for the medical care of the sick and wounded soldiers were struggling for attention and competing for time.

Briefly, the bill proposes to establish a corps of optometrists as an integral part of the Medical Department of the Regular Army. Optometrists who are graduates of schools approved by the Council on Education and Professional Guidance of the American Optometric Association are to be commissioned to the number of 60 officers in all grades from that of second lieutenant to that of colonel. Provision for admission of candidates to the Reserve Officers' Training Corps, the last two years of training at Government expense, is likewise a part of the bill. Officers of the Optometry Corps are to be assigned to optometric duty or administrative duty in connection therewith. When assigned to optometric duty, they are to perform optometric work determined upon by the appropriate medical officer, who must be an ophthalmologist.

There is no question about the valuable work done by Army optometrists in this war, especially in the early chaotic stages of induction, screening, and preparation. Millions of soldiers were refracted and millions of pairs of glasses were ordered. It was the established policy of the Medical Department that all refractions were to be done under the supervision of an ophthalmic medical officer who was in charge and responsible for this work in each particular clinic. The overwhelming

numbers of refraction cases obviously made active supervision impossible, and the optometrist was often entirely on his own, although theoretically supervised by the medical officer. It was assumed by the Surgeon General that the responsible medical officer had made himself familiar with the work of his optometrist and could know whether or not it was to be trusted. But here, again, especially in the early overwhelming days, checks and re-checks could simply not be made, for there were not enough ophthalmic medical officers available. As the result, the optometrist often had an exaggerated opinion of his work, resented his lack of commissioned rank, and writhed under the indignity of being a private soldier or non-commissioned officer, as unworthy of the "Eye Doctor" of the unit. The exaggerated opinion of the purely technical nature of his work was in marked contrast to that of the rear gunner, or the laboratory technician, or maker of dental prostheses in the hospitals, or, of innumerable enlisted men, many of them college graduates, in all sorts of technical, highly skilled, and often dangerous positions. The arguments brought out during the hearings by the optometrists emphasized this attitude of hurt ego. The argument made by representatives of the Surgeon General that "any intelligent soldier can be trained to do the work of an optometrist in the Army in six months" (meaning refraction), and shown to be true, was a body blow and considered by the optometrists to be below the belt, although there are many state-licensed optometrists, working and advertising in civilian life today, whose training in refraction was not more than from six weeks to six months. In the Army, the optometrist was used primarily for refraction, later in some cases for perimetry, and in the field for opticians' work. He became the valuable assistant to the

ophthalmic medical officer in many cases, with mutual profit and in an atmosphere of respect and friendship. But in all cases met with overseas, the optometrist was supervised by and responsible to the ophthalmic medical officer. In many cases, too, the ophthalmic medical officer felt that the services of his faithful optometrist ought to be recognized by promotion to warrant or commissioned grade, with the same praiseworthy interest that the pilot of a plane had for his rear gunner.

The War Department and Surgeon General's Office undoubtedly made a mistake in the beginning, by not establishing a top non-commissioned grade for the optometrist in various medical units. This was belatedly rectified and in the new Tables of Organizations the optometrist is given high non-commissioned status.

However, the creation of a separate corps of optometry is another thing. It undoubtedly will create cleavage, friction, and disharmony, and the professional care of the soldier who falls between will suffer. It would be wiser to reward services by a warrant or even commission in the Medical Administrative Corps or Sanitary Corps, provided that the optometrist is always responsible to an ophthalmologist. The joker here is that there are relatively few medical officers of the Regular Army who are ophthalmologists certified by the American Board, for in peace times the medical officer does all types of medical and surgical work including ophthalmology.

In the February, 1945, issue of the Journal of the American Optometric Association the statement was made by the president of the American Optometric Association, Inc., that "The Army Medical Department, by necessity, was forced to use the skills of the optometrists in visual care (sic), but it still refuses to accord them any professional (sic) recognition." This statement emphasizes the

two fallacies that the optometrists are so eager deliberately to get across in order to confuse the public. "Visual care" to the optometrist means something entirely different from what it means to the ophthalmologist. But the optometrists as a body have succeeded in their attempt to have it mean the same thing to the public, who is wittingly misled by false advertising such as "eye sight specialist" and "eye doctor." If the word "refraction" had been substituted for the term "visual care" in the foregoing quotation it would be too near the truth to suit the optometrist. "Professional recognition" is the old scheme to lift up a trade or commercial enterprise by its own bootstraps, or as the optometrists themselves use, the phrase "from downstairs to upstairs," as if the mere move itself made a profession out of what essentially is a technical trade.

The medico-legal aspect of the practice of optometry was discussed during the hearings. The charge was made and not satisfactorily refuted, that optometrists are held to be irresponsible for a mistaken or missed diagnosis of an ocular disease. The charge was backed up by legal citation (*Hampton vs. Brackin's Jewelry and Optical Co., Inc.*, 86 Southern 173, Supreme Court of Alabama). This court held that "since the disease of the plaintiff's eyes was not one that should have been detected by a skillful optometrist there was no legal liability." The optometrists in their testimony made a great to-do about the many courses given by the recognized schools devoted to teaching the students ocular and general pathology qualifying them for the detection of diseased conditions. Thus we see the curious phenomenon of a "profession" having it both ways with the helpless public in the middle. If the optometrist who "treated" a glaucomatous patient, for example, by frequent changes of expensive glasses until hopeless blindness ensued were held

legally liable, as is the physician, for his mistakes, the entire picture would change overnight, and we would see few optometrists eager to call themselves "eye doctor."

The move by the optometrists to obtain more recognition and prestige by the creation of a separate army medical corps is one that may have far-reaching effects in civilian life. It is subtle and clever. Armed with the authority of the bill, the optometrists can take the next step to persuade recognized universities to form faculties of optometry, a step which the majority are undoubtedly reluctant to take, for no new faculty of optometry has been established in any of our national, state, or municipal universities for about 20 years. Thus we see that this is not just an Army problem nor exclusively Army business. It is a problem that affects the entire medical profession, an important part of whose function is the safeguarding of the health of the public.

The report of the hearings occupies 123 pages of closely packed print and thus it cannot be reproduced here. Those who are interested, and the entire medical profession should be, will find much to stimulate their thinking and put them on the alert. A copy of the report (H.R. 1699) of the hearings can probably be obtained by writing to one's Congressman, and it is urged that this be done speedily. At the same time a protest against H.R. 3755 should emphatically be made to the members of Congress and particularly to the Chairman of the Senate Committee on Military Affairs, Senate Office Building, Washington.

It is conceded with admiration, too, that the better elements of optometry are striving to clean their house and rid it of advertising and the jewelry, drugstore, neon-sign type of optometrists. This house cleaning has a long way to go. A walk in any street of any town or city, or a glance at any newspaper in this coun-

try will reveal the truth of this statement. The influence of the relatively small number of high-class men in optometry is not too great, unfortunately, for the public. It will be a long time before the right to being called an "ethical profession" is earned, and that day will not come until optometrists are held to be legally liable by the courts of the land for their mistakes in diagnosis. If the optometrists are sincere in their desires to be professional instead of commercial men, let them voluntarily submit to the discipline of the court of malpractice. Let them stop calling themselves "eye doctors" or "eye sight specialists" and let them acquaint the public with their true function, which is chiefly refraction and not pseudoscientific misleading methods of "treatment" and "exercises" for diseased ocular conditions which they are not yet, as a group, qualified to recognize nor legally privileged to treat.

Derrick Vail.

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## CORRESPONDENCE

### THE USE OF THE METRIC SYSTEM IN OPHTHALMOLOGY

Editor,

American Journal of Ophthalmology:

Science has everywhere adopted the metric system. The change-over has been made in most scientific laboratories and hospitals. However, ophthalmology, since adopting the dioptric (metric) system, has been playing about with the metric and other systems. Articles, to this day, will mention one medicine dosage in the metric system and follow immediately with a dosage in the old apothecary system. In the same paragraph one measurement will be in millimeters and the next measurement in the linear. Responsible surgeons will speak scientifically of the strength of a lens using a meter for measurement and will then say "the vision is 20/20." In a recent article written by a man introducing a new method of ob-

serving the eye, the report is given as follows: "Vision of the left eye was the ability to count at two feet, which was improved 20/50 with glasses." A later sentence reads: "Tension in each eye 13 mm. Hg." This duplicity of systems is unscientific. Are we children that we cannot use the metric system of measurements in our scientific articles?

Seventeen years ago, in the midst of the British system (apothecary) and various other systems, our Central Province India Christian Mission Hospital adopted the use of the metric system exclusively. It has been in use there ever since. It seems logical that the American Journal of Ophthalmology should require that in articles published by them, the metric system be used for measurements of every kind. There is one exception—the taking of temperatures. This is still a nonmetric job in the English-speaking countries, but this change, too, could easily be made.

As ophthalmologists—who led in accepting the dioptric (metric) system many years previous to the acceptance of the metric system by even the laboratories of the English-speaking world—would it not be well to lead in complete acceptance of the metric system? At least let us relegate to the past the use of "feet" in measurements and say "6/6" instead of "20/20." We are a scientific people.

(Signed) Victor C. Rambo,  
110 Harvey Street,  
Philadelphia 44.

#### RECURRENT EROSION OF THE CORNEA

Editor,

American Journal of Ophthalmology:

In the treatment of the herpetic corneal lesion known as "Recurrent erosion of the cornea" or "bullous keratitis" (would not "Recurrent bulla of the cornea" be a better name?), the problem always is to prevent recurrence of corneal bullae during

the process of healing. Most ophthalmologists try to remove all the loose corneal epithelium, which may involve practically all the epithelium to within a very short distance of the limbus. They then usually scrub the exposed underlying stroma with some chemical irritant or escharotic in the expectation that the regenerating epithelium will form a firm adhesion to the underlying tissue. That success is by no means certain after one such treatment is attested by the considerable number of chemicals which are used for this application; those most commonly employed are iodine, phenol, and acetic acid in varying strengths and in various compounds and chemical modifications.

I believe iodine is the substance used most generally. In my experience, the ordinary U.S.P. tincture of iodine is not too satisfactory, because this preparation now officially contains a certain amount of potassium iodide, which makes it miscible with water. I prefer tincture of iodine made simply by dissolving iodine in alcohol; it is now non-official and precipitates when in contact with water. Therefore, when this preparation is applied to the anesthetized cornea, a brown deposit of iodine is precipitated; corneal epithelial regeneration is slower, the adhesion to the underlying stroma is firmer, and the tendency to recurrence is diminished. A solution of cocaine dropped on the cornea after the application of the iodine will arrest the further penetration of the iodine into the tissue if this seems desirable.

In cases wherein bullae recur after this treatment, I have always been able to secure a cure with the application of freshly prepared 1-percent aqueous solution of formaldehyde. Although with this product there is a greater tendency to corneal opacification, nevertheless it is well to have in reserve a form of treatment which can be used when one is more or less desperate. It seems superfluous to men-



tion that after curetting the cornea and scrubbing, a tight dressing should be left in place for three to five days.

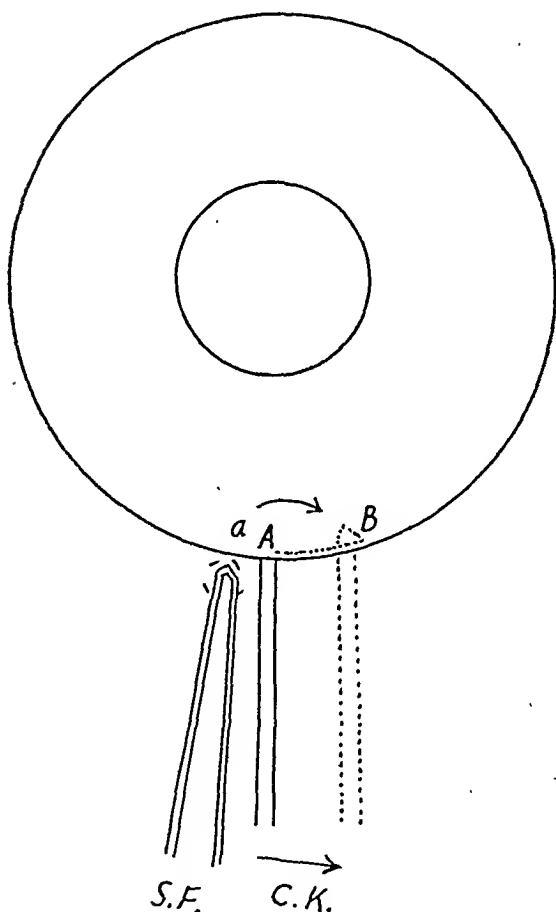
(Signed) Guernsey Frey,  
121 East Sixtieth Street,  
New York 22.

#### CORNEAL SECTIONS IN SOFT EYES

Editor,

American Journal of Ophthalmology:

In a recent case presentation appearing under Society Proceedings in the Ameri-



S.F., Scleral fixation, C.K., Cataract knife. A, Point of entry into anterior chamber. B, Termination of incision. Arrows indicate direction of incision.

can Journal of Ophthalmology, a contributor stated that he had experienced difficulty when making a keratome incision into a soft eye during a combined

cyclodialysis and iridectomy for the relief of glaucoma.

It has been my experience that the keratome is usually a poor instrument for this particular maneuver. If fixation is taken at 180 degrees from the point of entry into the anterior chamber, there is considerable distortion of the soft eye, which is caught between the pressure and counterpressure of the fixation and the keratome. If fixation is taken near the point of entry the traction upon the posterior lip of the incision is usually sufficient first to interfere with the production of a good section, and further to pull the plug on the remaining aqueous, thus making doubly sure that the keratome is going to run afoul of either the iris, the cornea, or the lens.

The following procedure is suggested in entering the anterior chamber of a soft eye, particularly if it has undergone surgical or traumatic perforation:

Scleral fixation is taken close to the limbus and adjacent to the point where entry into the anterior chamber is to be made. With a cataract knife the anterior chamber is entered immediately alongside the fixation. The cutting edge of the knife faces away from the fixation. When the point of the knife is just visible in the anterior chamber, an incision along the limbus is made—away from the point of fixation. The incision should not be carried past the point where its lips begin to buckle away from one another. If it is desired further to enlarge the incision this should be done with the Stephens or other corneal scissors.

This incision does not distort the eye. Surprisingly little aqueous is lost while it is being made. The chances of impaling the iris are negligible when compared with those inherent in the keratome incision.

(Signed) H. E. Allen,  
Metropolitan Building,  
Columbia, Missouri.

# ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the *Ophthalmic Year Book*. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the *Journal*.

## CLASSIFICATION

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|--|--|
| 1. General methods of diagnosis                        | 10. Retina and vitreous                                |
| 2. Therapeutics and operations                         | 11. Optic nerve and toxic amblyopias                   |
| 3. Physiologic optics, refraction, and color vision    | 12. Visual tracts and centers                          |
| 4. Ocular movements                                    | 13. Eyeball and orbit                                  |
| 5. Conjunctiva   | 14. Eyelids and lacrimal apparatus                     |
| 6. Cornea and sclera                                   | 15. Tumors   |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries   |
| 8. Glaucoma and ocular tension                         | 17. Systemic diseases and parasites                    |
| 9. Crystalline lens                                    | 18. Hygiene, sociology, education, and history         |
|  | 19. Anatomy, embryology, and comparative ophthalmology |

### 1

#### GENERAL METHODS OF DIAGNOSIS

Gipner, J. The interpretation of visual fields in neurotic patients. *New York State Jour. Med.*, 1945, v. 45, June 1, p. 1203.

Perimetric fields simulating field defects of organic disease in patients with functional disorders are often inaccurate in some details. They tend to change irregularly, and disappear with the cure of the patient. The perimetrist must carefully avoid suggestion when charting the field of vision in neurotic patients, so as not to transfer his preconceived ideas of the possible field to the suggestible patient. On the other hand, the examiner must keep an open mind in examining neurotic patients, so as not to miss perimetric signs of organic disease.

Theodore M. Shapira.

Miao, Tien-Yung. An ophthalmic slide rule. *Chinese Med. Jour.*, 1945, v. 63A, Jan., p. 80.

An ophthalmic slide rule for calculating or checking the following essential

measurements in ophthalmology is described: interpupillary distance, near point of convergence, binocular parallactic angle, angle of convergence, accommodating power in relation to age of patient, accommodation in diopters, visual field in degrees at working distances of 100 cm. and 75 cm., conversion of prism diopters into degrees, measurement of lens diopters, determination of meter angles. The rule is shown in diagrams and detailed instructions for its use are given.

Edna M. Reynolds.

Michaelson, I. C. A simple device for testing diplopia. *Brit. Jour. Ophth.*, 1945, v. 29, July, pp. 376-378.

A device which fits into the Hamblin ophthalmoscope handle is described and photographs are presented. The device is a tube closed at the top and having its posterior wall cut away. The anterior wall is perforated in the shape of an arrow. A 10-inch string is fixed to the top of the tube, marked off in inches and weighted at its free end.

The distance between the false and

the true images can be found by asking the patient to touch the arrow and then point to the false image. By means of the string, the surgeon measures the distance between the arrow and the patient's finger. Inch-spaced pieces of metal on the string make it possible in the dark to measure the separation. The degree of tilting of the false image can be found by tilting the handle of the lamp until the false image is erect and then noticing by touch the angle between the handle and the dependent string. (2 figures.)

Edna M. Reynolds.

## 2

### THERAPEUTICS AND OPERATIONS

Cameron, A. J. Penicillin in ophthalmic therapeutics. *Brit. Med. Jour.*, 1945, Feb. 17, p. 222.

The author has investigated as to whether the activity of penicillin is in any way affected by simultaneous use of other drugs commonly employed in ophthalmology. Adrenalin was the only drug which inactivated the penicillin, but neither cocaine, decicaine, atropine, eserine, argyrol, nor fluorescein had any inhibitory influence on penicillin. R. Grunfeld.

Filatov, V. P. Tissue therapy in military medicine. *Viestnik Oft.*, 1943, v. 22, pt. 5, p. 6.

Tissue therapy, introduced by Filatov in 1933 and the subject of over one hundred papers by him and co-workers, is reviewed with particular reference to eye diseases. Its principle is the utilization of "biogenic stimulators" (developed in tissues surviving in an unfavorable environment) for promotion of processes of absorption and regeneration. At first only homoplastic preserved and surviving tissue was employed for transplantation. Later auto-

plastic and heterogenic tissue was also used. Still later tissue fluids, and extracts from plants, preserved in darkness to create an unfavorable environment, have been experimented with. While the notion of the "biogenic stimulators" is only a working hypothesis and their chemical nature not yet ascertained, biologic tests in the form of curative effects, of effects on growth of tissue cultures, and on tissue regeneration establish their presence. Tissues are preserved for seven days at a temperature of three degrees above freezing. Leaves of plants are kept for 15 to 20 days in darkness, at a low temperature.

Tissue therapy has been employed at the front by Filatov with excellent results in four groups of eye diseases: keratitis, uveitis, optic atrophy, and trachomatous pannus. The results are illustrated by brief references to cases. In particular, tissue therapy, in the form of placental implantation and injections of placental extract, is regularly used as an adjuvant in corneal transplantations, to forestall complications and clouding of the transplant. Further details in regard to applications of tissue therapy and case reports are to be found in the publications of the Ukrainian Institute of Experimental Ophthalmology and in *Viestnik Oftalmologii*, as well as in nonophthalmologic journals. M. Davidson.

Keyes, J. E. L. Penicillin in ophthalmology. *Sec. on Ophth. Amer. Med. Assoc.*, 1944. 94th mtg., pp. 48-64. (See *Amer. Jour. Ophth.*, 1945, v. 28, Sept., p. 926.)

Weiss, C., and Shevsky, M. Clinical bacteriology and cytology of some ocular infections. *Amer. Jour. Clin. Path.*, 1944, v. 14, Nov., p. 567.

The author presents bacteriologic and cytologic findings in 136 cases of acute and chronic infections of the eye. The report also covers the flora of the normal eye, and observations on three types of virus infection. A case of orbital infection due to *Torula histolytica* (cryptococcus hominis) is described which is the second of its kind in the literature. The results of routine bacteriologic and serologic examination in ocular infections may serve the ophthalmologist as a guide in the choice of the most suitable sulfonamide, or in the selection of other types of specific treatment, or as an aid in the prognosis or the epidemiologic management of a case. In order to prevent serious post-operative infection, the author would culture the conjunctiva in every patient who is about to have an intraocular operation. Theodore M. Shapira.

## 3

PHYSIOLOGIC OPTICS, REFRACTION,  
AND COLOR VISION

Kamellin, Samuel. Catmin lenses. *Amer. Jour. Ophth.*, 1945, v. 28, Sept., pp. 993-998. (2 figures.)

Simonson, E., Blankstein, S., and Carey, E. The efficiency of the glare reduction by the eyelids. *Amer. Jour. Physiology*, 1945, v. 143, no. 4, p. 541.

Light and dark adaptation were used to measure the coefficient of light penetration through the eyelids, after exposure times varying from 2 to 300 seconds. Only approximately 1 per cent of physiologically effective light calculated from light adaptation, and 0.6 per cent calculated from dark adaptation, penetrates the eyelids. The values in three well-trained subjects were similar, in spite of considerable individual differences in the speed of light and dark adaptation.

The high efficiency of the protection against glare is probably to a large extent due to a change of spectral distribution during passage through the eyelids. Theodore M. Shapira.

## 4

## OCULAR MOVEMENTS

Giardulli, Antonio. Diabetic ophthalmoplegias. *Rev. Brasileira de Oft.*, 1945, v. 3, June, pp. 211-213.

A man of 59 years complained of diplopia of twenty days duration. Movement of the right eye was diminished in the sphere of action of the internal rectus. A few days later complete ptosis of the upper lid of the same eye developed. Laboratory tests were negative except as to excessive glycosuria. The muscular disturbance disappeared after five months on systemic treatment. Relapse occurred a month later, perhaps as a result of dietetic neglect, but the ocular symptoms again disappeared after twenty days.

W. H. Crisp.

Michaelson, I. C. A simple device for testing diplopia. *Brit. Jour. Ophth.*, 1945, v. 29, July, pp. 376-378. (See Section 1, General methods of diagnosis.)

Ramsay, A. M. An analogy between eye strain (asthenopia) and heart strain (angina). *Glasgow Med. Jour.*, 1945, v. 143, April, p. 109.

An analogy exists between the function and innervation of the heart and of intrinsic eye muscles. Both are involuntary muscles and act as contractors as well as dilators. In each case innervation is by means of a double nerve supply, from the parasympathetic which controls contraction and the sympathetic which controls dilatation. Upon the maintenance of perfect sympathetic-parasympathetic balance de-

pende the smooth normal functioning. Disturbance of the equilibrium may be considered as the first sign of approaching disease. R. Grunfeld.

Robinson, J. S. Summary of reexamination of orthoptic patients with consideration of permanence of results. *Amer. Jour. Ophth.*, 1945, v. 28, Sept., pp. 999-1007.

## 5

## CONJUNCTIVA

Bland, J. O. W., and Wilson, R. P. Bacteriologic and clinical observations on the treatment of the acute ophthalmias of Egypt with sulfonamides and penicillin. *Brit. Jour. Ophth.*, 1945, v. 29, July, pp. 339-355.

In the experiments reported, no attempt was made to maintain an adequate concentration of the sulfonamide compounds in the blood. Attention was focused on the bacteriologic effects of the drug in relation to the conjunctiva rather than on any particular blood level. To reduce treatment to its utmost simplicity, only two doses of the sulfonamides were given in 24 hours. A table is given basing dosage on age rather than on body weight. To follow the bacteriologic progress of the case, smears from the conjunctival discharge were examined before treatment commenced and at regular intervals thereafter. A single dose of sulfapyridine cured a considerable proportion of gonococcus cases, but Koch-Weeks cases were more resistant. Two doses of sulfapyridine were not noticeably more effective than a single dose. Two doses of sulfathiazole at 8-hour intervals in one day cured almost all gonococcus cases but not all Koch-Weeks cases. Two doses of sulfathiazole on two successive days cured all cases of gonococcus and Koch-Weeks ophthal-

mia with very rare exceptions. A single intramuscular dose of penicillin resulted in negative smears in three to four hours, but relapses occurred unless a lasting cure was insured by repeated doses at short intervals. Penicillin had no effect on Koch-Weeks cases and is therefore thought unsuitable for acute Egyptian ophthalmia. (5 tables, references.) Edna M. Reynolds.

Burnet, E., Cuénod, A., and Nataf, R. Treatment of trachoma by an azo-sulfonamide (G.33). *Presse Méd.*, 1941, July 16-19, pp. 763-765.

This sulfonamide, the sodium or potassium salt of parasulfamidophenyl-azosalicylic acid, synthesized in 1936 by French workers, is reported to be both efficacious and of low toxicity in trachoma. The authors used a dosage of 3 grams per day for periods of from two to three weeks and, if necessary, repeated the course after a rest period. Up to 300 grams were given without toxic signs. Of 300 cases treated only 12 had an erythema of mild degree and one a pruritus. A minor drop in white cells, particularly neutrophiles, sometimes occurred but no actual case of leukopenia developed. The drug was efficacious in trachoma, improvement being obtained in all treated cases. Of 23 cases studied completely, certain healing occurred in 18. Rapid cure of secondary infections due to Koch-Weeks bacilli and to the diplobacilli of Morax-Axenfeld was noted.

Phillips Thygeson.

Darius, D. J. Penicillin treatment of trachoma. *Amer. Jour. Ophth.*, 1945, v. 28, Sept., 1007-1009. (References.)

Mescheriakova, A. V. Oculoglandular tularemia. *Viestnik Oft.*, 1943, v. 22, pt. 5, p. 45.

Three cases of oculoglandular tularmia are reported and their identical clinical picture is summarized as follows: an acute febrile onset, marked chemosis of lids, small ulcers on palpebral and ocular conjunctivas with clean floors, dilatation of lymphatic vessels which appear about the fourth week, scanty secretion, positive tularin test, and a preauricular bubo followed in four to six days by cervical and submaxillary glandular enlargement.

M. Davidson.

Pavlov, N. M. The combined mechanochemotherapy of trachoma. *Viestnik Oft.*, 1943, v. 22, pt. 5, p. 32.

The combination of expression and chemotherapy has been found to result in a considerably greater percentage of cures of trachoma III than either method used alone, on the basis of 104 cases treated by the combination. The average hospitalization of the cases was 48 days. The chemotherapeutic agent is massage with a salve of brilliant green 0.025, copper citrate 0.2, white streptocide 0.2, vaseline 10, for ten days daily between expressions, and followed by a rest of six to ten days. Use of two or three such courses of treatment resulted in curing 76 per cent of the cases in the course of 1 to 1½ months. The milder cases got well under the use of massage with salve alone.

M. Davidson.

Pavlov, N. M. The use of endemic indices in the epidemiology of trachoma. *Viestnik Oft.*, 1943, v. 22, pt. 5, p. 29.

Use of the trachoma-rate alone is not sufficient in formulating plans for an adequate antitrachoma campaign. While the growth of the focus is indicated by increase in the trachoma-I rate, its reduction is indicated by increase of the trachoma-IV rate. The

trachoma progress-index may be expressed by the formula: Tr. I/Tr. II plus Tr. III. The trachoma regression-index is expressed by the formula: Tr. IV/Tr. I plus Tr. II plus Tr. III. The index of activity of the focus is expressed by the difference between the first and second indices, which may be positive or negative. The intensity index is obtained by the relation between the number of serious cases and the total number of trachomas, multiplied by one hundred. The surgical index is valuable and is given by the relation of the number of cases requiring surgery to the total number of trachoma cases, multiplied by one hundred. Different measures are indicated by the latter two indices in the campaign. Foci studied showed an intensity index varying between 0.1 and 15.6; and a surgical index varying between 0.1 and 10.3.

M. Davidson.

## 6

### CORNEA AND SCLERA

Aynsley, T. R. The use of insulin in the treatment of corneal ulcers. *Brit. Jour. Ophth.*, 1945, v. 29, July, pp. 361-363.

Five cases of corneal ulcer are reported in which treatment with insulin gave rapid healing. It was used either locally as drops or by injection. Recently the author has confined the insulin treatment to injection of five units daily. Three possibilities are considered by the author. Insulin either improves the patient's nutrition, or removes some factor necessary for germ-metabolism, or increases the rate of epithelial proliferation.

Edna M. Reynolds.

Camino P., Carlos. Operation of corneal transplant. *Arch. Chilenos de Oft.*, 1944, v. 1, Nov.-Dec., pp. 13-19.

With minor variations, the author has followed the teaching of Castroviejo. He records five cases. One patient developed glaucoma secondary to pupillary ulcers which had existed before the corneal operation. For the glaucoma an iridectomy was undertaken, and this was followed by total hyphema and further hypertension, so that vision of 2/20 which had existed two months after the corneal operation was lost by opacification of the implant.

The second case was unsuitable for corneal operation, being complicated by extensive vascularization, secondary glaucoma, and cataract. In the third case it was impossible to obtain adequate mydriasis with atropine, and the iris adhered to the margin of the implant. Because of this difficulty in producing mydriasis, the author's last two operations were performed under maximal miosis, and were successful. In one of these, the vision after two years was 5/10; in the second, practically useful vision of 5/40 was obtained in spite of the presence of a lens opacity. (3 figures.) W. H. Crisp.

Chan, Eugene. Blue sclerotics associated with bony defects in the nose. *Chinese Med. Jour.*, 1945, v. 63A, Jan., p. 55.

A case of blue sclerotics in a Chinese girl aged 18 years is reported. The familial history was insignificant. There was no history of blue sclerotics or fragile bones in the family. There was no consanguinity. The girl's scleras had been blue since birth and she had had two fractures, one of the elbow eight years previously and one of the knee three years previously. Physical findings were negative except for the light blue scleras, protrusion of the left eye-

ball, and a large tumor mass in the left side of the nose. Biomicroscopy of the eyes showed definite thinning of the corneas. Biochemical analysis showed a definite increase in blood calcium.

The tumor mass in the nose was a giant-cell tumor which had invaded the ethmoid and sphenoid sinuses. After removal of the tumor, the patient developed secondary anemia. The left eye remained proptosed and was enucleated when the vision dropped to hand movements. The cornea was found to be only three fourths as thick as that of a normal eye. Stained sections of the sclera showed a decrease in the number of fibers but no change in their size. The sclera was one third to two thirds as thick as normal. Biochemical determinations of calcium in the sclera showed almost ten times as much calcium present as is normally found.

A summary of the literature is given and theories as to the cause of blue sclerotics are discussed. In view of the osseous lesions in the nose and the preponderantly high values of calcium in the sclera in this case, overactivity of the parathyroid glands is suggested as an etiologic factor. (References.)

Edna M. Reynolds.

Lee, F. M. Scleral abscess. *Chinese Med. Jour.*, 1945, v. 63A, Jan., p. 60.

Two cases of scleral abscess are reported, both of which developed after operative interference. One was in a boy, aged eight years, on whom bilateral optical iridectomy was performed. He was entirely uncoöperative and removed the dressings after the operation. One eye became infected and a scleral abscess 3 by 3 mm. formed. This was incised and 0.5 c.c. of greenish pus was evacuated. Cultures showed streptococcus viridans. The

wound healed but the eye subsequently became phthisic. The fellow eye remained unaffected.

The second case of scleral abscess occurred in a man aged 30 years on whom a bilateral iridectomy was done. One month after operation a deep abscess appeared in the right eye close to the limbus. Following incision and curettement, the wound healed well and the end result was good.

There is discussion of metastatic and traumatic scleral abscess, with a review of the literature. (References.)

Edna M. Reynolds.

Mao, W. S. Keratoconus. Chinese Med. Jour., 1945, v. 63A, Jan., p. 90.

A case of unilateral keratoconus associated with trachoma III is reported. The patient was a male aged 37 years, who gave a history of recurrent attacks of ocular inflammation over a period of six years. Twenty days after the onset of the first attack, a white spot appeared in the center of the right cornea. Vision in this eye became gradually reduced to light perception, the cornea gradually bulged, and the eye turned in. Vision had never been good in the left eye but this eye showed no bulging of the cornea. The family history suggested that the patient's maternal uncle might have had a unilateral keratoconus.

Ophthalmologic examination revealed bilateral trachoma III. In addition, the right eye had convergent strabismus of 35 degrees and keratoconus. The left eye showed nebulae of the cornea but no keratoconus. Visual acuity was: right, light perception; left, 3/60, improved to 6/30 with -1.25 sphere. Tension was normal in each eye. The cone of the right cornea was located somewhat inferiorly and nasally. The cen-

tral part of the cornea was densely white.

Biomicroscopy showed a Fleischer ring and irregular superficial linear scars at the apex of the cone. Whitish-gray striae were present in large numbers, deep in the stroma, and there was increased visibility of the nerve fibers. The general physical examination was negative except for a strongly positive Kahn test. The patient was well built and well nourished.

Keratoconus is a very rare disease in China, only two cases being reported to date. (References.)

Edna M. Reynolds.

Pinticart de W. Elcira. On the use of vitamin B<sub>2</sub> (riboflavine) in two cases of hereditary parenchymatous keratitis. Arch. Chilenos de Oft., 1944, v. 1, Nov.-Dec., pp. 21-23.

In two patients aged 14 and 15 years respectively, daily treatment with riboflavin was thought to be responsible for improvement which occurred after 29 and 20 days of treatment respectively.

W. H. Crisp.

Rodigina, A. M. Local application of sulfidine (sulfapyridine) in *ulcus serpens*. Viestnik Oft., 1943, v. 22, pt. 5, p. 17.

Excellent results are reported from use of a 2-percent ointment in 26 cases, with 50 percent of the cases complicated by the presence of trachoma. In 96 percent of the cases the infection followed minor injuries of the cornea. In 22 of the cases a virulent strain of pneumococci, as established by inoculation of guinea pigs, was present, alone or in association with other microorganisms. The process has been seen to stop quickly. No perforation occurred, and better visual acuity was



secured than would have been otherwise obtained. The only complication noted was a mild transitory secondary iritis after the corneal process had stopped, and attributable either to liberation of toxins from the killed pneumococci or to direct action by penetration of the drug into the anterior chamber.

M. Davidson.

Sun, K. S. **Tuberculoma of the sclera.** Chinese Med. Jour., 1945, v. 63A, Jan., p. 67.

A case of tuberculoma of the sclera in a patient 22 years old is reported. Four months prior to hospital admission, the patient gave birth to a child. A few days after delivery there was lacrimation and redness of the left eye. A month before hospital admission the vision of the left eye became markedly impaired. There was no history suggestive of tuberculosis in the family. Examination of the eyes showed the right one to be normal. The left eye showed elevation and congestion of the bulbar conjunctiva on the temporal side and there was adhesion to the underlying sclera, which showed in this region a bulging mass measuring 2 by 10 by 10 mm. The cornea showed generalized haziness. There was no vascular infiltration. The fundus could not be seen.

Fluoroscopy showed a tuberculous process in the left lung. The sedimentation rate was 57 percent and the intradermal tuberculin test was strongly positive in a 1 to 1,000 dilution. Biopsy of the tumor showed many typical tubercles. At the time of admission there was no adenopathy, but forty days after admission one preauricular lymph node on the left side was found enlarged. This was removed and showed the presence of many caseous areas and characteristic tubercles. A

review of the literature shows only seven other reported cases of tuberculoma of the sclera. (References.)

Edna M. Reynolds.

Svatikova, A. G., Chaikovskii, V. K., and Genne, M. P. **The treatment of keratitis with amnion preparations.** Viestnik Oft., 1943, v. 22, pt. 5, p. 25.

Amnion preparations used experimentally on rabbit cornea were found to hasten the epithelization of corneal wounds and to achieve it  $1\frac{1}{2}$  to 2 times as fast as in controls. An ointment of amniotic lipoids has been used with excellent results in a variety of cases of keratitis. Subjective improvement is noted in one to two days.

M. Davidson.

## 7

### UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Barrenechea, S., and Contardo, R. **Two cases of uveitis associated with alopecia, vitiligo, dysacusia, and poliosis (syndrome of Vogt-Koyanagi).** Arch. Chilenos de Oft., 1944, v. 1, Sept.-Oct., pp. 5-10A.

The two cases described occurred in women of 44 and 26 years respectively. In the older patient the poliosis appeared shortly after loss of the hair of the head, appearing in the new hair and in the existing hair, including the outer third of the eyelashes. In this patient the macula was involved and the final vision recorded for the right eye was counting fingers at one meter and for the left eye 0.2. In the second patient the final vision recorded was 0.4 for each eye with correction. In each case roentgenography of the teeth disclosed apical abscess of one or more teeth. Treatment with tuberculin was tried in one case, but without effect.

One of the patients later underwent cataract extraction without complication. (References.) W. H. Crisp.

Brucher Encina, Rene. **Metastatic endophthalmitis treated with penicillin.** Arch. Chilenos de Oft., 1944, v. 1, Sept.-Oct., pp. 15-16.

The patient, a woman of 27 years, was hospitalized for septic abortion at three months pregnancy. In spite of the use of sulfathiazole, a violent endophthalmitis developed, with a mass behind the pupil. Light perception was lost. Two weeks after intramuscular treatment with penicillin, vision of 0.4 had been recovered, and vision further improved to 0.8. W. H. Crisp.

Schultz, Abraham. **Boeck's sarcoid with uveoparotitis and dacryoadenitis.** Amer. Jour. Ophth., 1945, v. 28, Sept., pp. 1010-1014. (4 figures, references.)

Shershevskaya, O. I., and Kopil-Levina, Z. A. **Pupillary disturbances in craniocerebral trauma.** Viestnik Oft., 1943, v. 22, pt. 6, p. 14.

A case of Adie's pupillonia is described in connection with a cerebral contusion to which it was attributed. M. Davidson.

## 8

### GLAUCOMA AND OCULAR TENSION

Awerbach, M. I., and Ivanova, E. M. **Cyclodiathermy in glaucoma.** Viestnik Oft., 1943, v. 22, pt. 5, p. 3.

In 1940 Vogt's cyclodiathermy was introduced in the Helmholtz Central Ophthalmic Institute of Moscow, and 52 operations have been performed since. Only one fourth of the ciliary body is subjected to punctures, so as to provide for repetition of the operation when necessary. The operation has been found simple and safe. The

best results have been achieved in aphakic eyes, in eyes with total leucomata, in traumatic glaucoma, and in congenital subluxation of the lens. In cases of sympathetic uveitis, after brief hypotony there was noted a short spell of increased tension, which later subsided. The operation was found to facilitate deepening of the anterior chamber for later antiglaucomatous operations, and also for extraction of cataract. In only two cases was there hypotony lasting as long as two or three weeks. In one case the operation on one eye was also followed by lowered tension in the other. The results are most permanent in secondary glaucoma. They are believed due to the temporary drainage, with subsequent permanent ciliary-body atrophy and hyposecretion. M. Davidson.

Paulo, A., Jr., and Arruda, J. de. **Comments regarding one hundred glaucoma observations.** Rev. Brasileira de Oft., 1945, v. 3, June, pp. 201-206.

In a brief article, the author warns against resorting to operation in any case in which, even if the condition is acute, it is possible to control the intraocular tension with miotics. For absolute glaucoma with pain, he resorts to retrobulbar injection of absolute alcohol. W. H. Crisp.

Rones, Benjamin. **The relationship of German measles during pregnancy to congenital ocular defects.** Med. Annals District of Columbia, 1944, v. 12, Aug., p. 285. (See Section 9, Crystalline lens.)

Sverdlov, D. G. **Changes in the scleral and corneal nerves in absolute glaucoma.** Viestnik Oft., 1943, v. 22, pt. 6, p. 32.

Pathologic studies of five glauco-

matous eyes and five dog eyes were compared with study of two otherwise healthy human eyes enucleated because of injuries. A peculiarity of the normal scleral nerves is that after entering the sclera with the vessels they divide into medullated and nonmedullated branches which not only follow closely the scleral fibers but remain in the same interlamellar space. In glaucoma they were found to have proliferated to a great extent and to have thicker branches. There were also thickenings in their course, which occasionally appeared as a spiral similar to that observed in regeneration of sectioned nerves, or in general to the formations found in neuromata. The corneal nerves on the other hand exhibited forms of degeneration rather than of regeneration. On the basis of the nerves not ending in cells and of their following the scleral fibers, the function of the scleral nerves is considered not as trophic or centrifugal but as centripetal tension-receptors, that is conducting the stimuli of contraction and relaxation of the scleral fibers. Such tension enteroceptors have been described in the diaphragm, meninges, bladder, stomach, and intestines. When such receptors are irritated they proliferate and, as in true neuromata, register pain, although normally not pain receptors. Whether the findings represent a primary process or a secondary phenomenon the result of hypertension is at present not clear. M. Davidson.

## 9

## CRYSTALLINE LENS

Bhat, P. K. Hypotony following cataract extraction. *The Antiseptic*, 1945, v. 42, Jan., p. 45.

After an intracapsular cataract extraction with peripheral iridectomy the

wound healed perfectly within ten days and no complication occurred. Eleven days later the aphakic eye showed hypotony with ciliary injection, haziness of the cornea, and striate keratitis. The cataract wound margins were quite in apposition and no filtration was present. The author attributes the hypotony to ophthalmomalacia or essential phthisis. R. Grunfeld.

Espíldora-Luque, C., O'Reilly, G., and Manns, E. Ultrarapid opacification and spontaneous reabsorption of the lens. *Arch. Chilenos de Oft.*, 1944, v. 1, July-Aug., pp. 12-17.

A man aged 23 years had lost the left eye in an accident years previously. Three days before visiting the clinic the vision of the right eye had become cloudy, the disturbance being accompanied by severe ocular and periorbital pain. Before the change, the vision of this eye had been 2/3 with minus 11.00 D. sphere. The left eye showed extensive iridodialysis and complicated cataract, with poor light perception and projection. The right eye was intensely injected and had a complete intumescent cataract. The tension was 23 mm. Schiötz. In the course of treatment, the aqueous humor, at first clear, began to show a great number of snowy flakes, and after a few days a horizontal fissure appeared in the center of the lens capsule, which became tremulous. The inflammatory reaction continued.

At this stage roentgenography of the teeth showed a filled upper premolar, on the side of the acutely involved eye, and containing a metallic filament which occupied the whole length of the central canal and even projected about 2 mm. beyond the apex of the tooth into the alveolus, but without any trace of inflammatory focus or bony lesion.

Two lower molars on the same side appeared suspicious of an apical inflammatory lesion. One hour after extraction of the premolar the patient had his last painful crisis. The lens flakes and the lens substance in general steadily became absorbed. Rather more than a month later the patient had normal vision of this eye with a plus spherical correction. W. H. Crisp.

Kamellin, Samuel. Catmin lenses. *Amer. Jour. Ophth.*, 1945, v. 28, Sept., pp. 993-998. (2 figures.)

Poppe, Erik. Experimental investigations of the effects of roentgen rays on the epithelium of the crystalline lens. *Acta Radiologica*, 1942, v. 23, no. 4, pp. 354-367.

In an experimental series 34 rabbits were irradiated with X ray. Each received 1,500 r in 45 minutes. Although in histologic preparations epithelial changes were observable 24 hours after irradiation, cataract became manifest clinically only after four months from the experimental irradiation. The opacities were seen in the region of the posterior pole, immediately in front of the posterior capsule. They consisted of numerous vacuoles and streaks, forming a disc-shaped or saucer-shaped opacity densest, as a rule, toward the periphery, and sharply demarcated anteriorly toward the clear remaining part of the cortex. Beneath the anterior lens capsule diffuse vacuoles and striae were seen but were less pronounced than posteriorly.

Radiation cataract develops because of pathologic alterations in lens epithelium, and consequent interference with the nutrition of the lens. From the fiber-forming epithelium, pathologic fibers grow in the equatorial region, spreading and disintegrating in

the subcapsular region of the cortex. This development explains the long latent period between irradiation and the clinical manifestation. (16 illustrations, references.) R. Grunfeld.

Rones, Benjamin. The relationship of German measles during pregnancy to congenital ocular defects. *Med. Annals District of Columbia*, 1944, v. 12, Aug., p. 285.

When in 1941 Gregg reported that in 78 cases of congenital cataract occurring in infants the mother had with a few exceptions had rubella in the early months of pregnancy, the State of South Australia sent out a committee to investigate the matter. The committee's conclusion is that if a woman contracts rubella in the first two months of pregnancy her chances of giving birth to a congenitally defective baby are in the neighborhood of 100 percent, whereas if she contracts rubella in the third month about 50 percent will be afflicted.

The author reviews his case histories of the last year. Three women had rubella and one had measles. In the two cases in which the exanthem occurred during the second month of pregnancy the infants developed cataract, while in the two cases in which the disturbance occurred in the third month of pregnancy the infants were afflicted with congenital glaucoma.

R. Grunfeld.

Rosen, Emanuel. Traumatic lenticulus posterior. *Brit. Jour. Ophth.*, 1945, v. 29, July, pp. 370-373. (See Section 16, Injuries.)

## 10

### RETINA AND VITREOUS

Bailliant, P. The prognosis of arterial hypertension as judged from the ap-

pearance of the retina. *Presse Méd.*, 1944, Nov. 18, pp. 267-268.

Bailliart discusses in detail the various ophthalmoscopic signs which are of prognostic value in hypertension. Of these, edema of the papilla is the most serious. Even mild edema of the disc margins, particularly if bilateral, suggests a grave prognosis. Thrombosis of the central retinal vein in a hypertensive patient likewise implies a poor prognosis and when accompanied by a low retinal arterial pressure in both eyes is indicative of approaching serious cerebral complications. Another bad prognostic sign is a disturbance of the normal ration (1 to 0.45) between the brachial and the retinal arterial pressures in which the retinal pressure reaches or even surpasses the brachial. A correctly measured diastolic retinal pressure of 150 mm. Hg indicates, irrespective of the brachial pressure, an approaching breakdown of the cerebral circulation. Changes in the vessels themselves are considered of great value in determining prognosis and the various abnormalities are discussed in detail. The article concludes with a discussion of the nature of hypertension.

Phillips Thygeson.

Contardo A., R., and Peralta G., A. Retinal venous thrombosis and its treatment by radiotherapy. *Arch. Chilenos de Oft.*, 1944, v. 1, July-Aug., pp. 22-41.

With a rather extensive review and summary of the literature of the subject, the authors associate a consideration of the action of radiation on the normal eyeball. They tabulate seven cases in which such treatment was used for retinal thrombosis, and they express the opinion that radiotherapy is indicated in every case of thrombosis produced by external pressure upon

the vessel with secondary formation of thrombus and with occlusion of the vessel walls by inflammatory affections. They would use anticoagulant preparations in the treatment of blood dyscrasias—with formation of thrombus, and in occlusion due to thrombus from stagnation secondary to arterial spasm, supplementing such treatment with the use of vasodilators. (References.)

W. H. Crisp.

Espíldora Luque, C. Concerning ophthalmoscopic classifications of arterial hypertension. *Arch. Chilenos de Oft.*, 1944, v. 1, Nov.-Dec., pp. 5-11.

In this short article, the author suggests that Wagener and Keith have made the mistake of believing that the ophthalmoscopic phase of hypertension was inseparably united to the general clinical phase of the disease! (References.)

Girault-Dangely, Y. Antivitamin K and obliteration of the central artery of the retina. *Presse Méd.*, 1945, June 16, pp. 327-328.

Four young adults with closure of the central artery of the retina were treated with one of the antivitamin-K preparations, 3,3 methylene 4,4 dihydroxycoumarine (Dicoumarol), in 50-mg. tablets, a total of 15 being taken in 48 hours and the course repeated after an interval of one week if necessary. Except for an epistaxis in one hypertensive patient no complications ensued. An apparent therapeutic effect was noted in all four cases. Five additional patients with hypertension and arteriosclerosis, all over sixty years of age, were treated similarly without result. The author points out that the four young subjects had associated retinal disease which may have contributed to the vascular condition,

whereas the older subjects presented the classical picture of occlusion of the central artery. Phillips Thygeson.

Hart, J. L. Quinine amblyopia with spontaneous detachment. *Brit. Jour. Ophth.*, 1945, v. 29, July, pp. 375-376. (See Section 11, Optic nerve and toxic amblyopias.)

Kolen, A. A., and Shereshevskaja, G. M. Pathogenesis of vitreous opacities and a new method of treating them. *Viestnik Oft.*, 1943, v. 22, pt. 5, p. 11.

While the etiology of vitreous opacities is in some cases known, as in high myopia, anemia, and injuries, their pathogenesis is not clear and is moreover not likely to be the same. Archangelsky in 1929, having secured definite results from blood transfusion, came to the conclusion that blood transfusion has colloidoclastic effect on the vitreous. Since 1933, Kolen's Novosibirsk Eye Clinic has been devoting itself to the study of affections of the vitreous and their treatment. The working hypothesis underlying the studies is that vitreous opacities are the result of penetration into it of excessive quantities of fluids from the blood, and that the conditions for such an excessive transfer are increased permeability of vessel wall and decreased blood coagulability. In most of the cases where no satisfactory etiologic factor could be isolated, thrombopenia and delayed retraction of coagulum were noted, and accompanying the positive effect on the vitreous opacities were noted an increase of thrombocytes and acceleration of coagulum retraction. Since the effect of blood transfusion is rather complex, the simpler thrombocytopoietic factor found in the duodenal juice by Shereshevskaja was utilized. This is secured from a healthy

donor and introduced by means of the duodenal catheter into the patient with vitreous opacities. The results are the same as from blood transfusion and serve to demonstrate the correctness of the hypothesis. Nine cases are tabulated to illustrate the thesis.

M. Davidson.

Kruglyi, A. The dynamics of light-sense disturbances under repeated brief exposure to low barometric pressure. *Viestnik Oft.*, 1943, v. 22, pt. 5, p. 40.

By means of the radioactive adaptionometer of Fedorov, especially suitable for experimental work with a pressure chamber, it was established that the lowered dark adaptation first noted at the 5,000-meter level disappeared in 10 days when the exposures were repeated every day or every second day, and then became practically normal. There is thus definite habituation to low pressures. (Illustrated.) M. Davidson.

Lucic, Hugo. Juvenile disciform degeneration of the macula. *Amer. Jour. Ophth.*, 1945, v. 28, Sept., pp. 965-979. (16 figures, references.)

Newson, A. L., and Armstrong, K. B. A case of burns associated with bilateral retinitis. *Med. Jour. Australia*, 1945, v. 1, May 5, p. 459. (See Section 16, Injuries.)

Riser, P., Becq, Couadau, and Lavitry. Papilloretinitis in arterial hypertension. *Presse Méd.*, 1941, Oct. 1-4, pp. 1058-1062.

Many hypertensive patients develop neither papilloretinitis nor intracranial hypertension and show a tolerance of long duration to their disease. An important number of patients, however, develop, after a period of years, the picture of intracranial hypertension and

papilloretinitis, which carries a very poor prognosis. The authors have studied, both in experimental animals rendered hypertensive by adrenalin injections and in humans, the factors which lead to retinal and intracranial complications. Among those considered were (1) toxic factors, principally the retention of chlorides, (2) venous hypertension, (3) local cerebral lesions such as edema, hemorrhage, and serous arachnoiditis, and (4) local retinal vascular changes. There is a full discussion of each of these. In experimental hypertension as well as in permanent hypertension they found that the elevation of pressure in the temporal, retinal, and cerebral arteries was proportionately much greater than in the arteries of the extremities. The retinal and cerebral capillary bed is therefore subjected to a strain which is particularly great and which would obviously favor transudation. Edema of the disc is a phenomenon which may appear in the course of arterial hypertension; it may continue for some time without intracranial hypertension but usually does not do so. Conversely, intracranial hypertension may occur without retinal changes but such a situation is usually of short duration. It is concluded that a papilloretinitis represents the association in various proportions of all the factors making for malignant hypertension. Phillips Thygeson.

Riser, P., Couadau, and Géraud. The prognostic value of papilloretinitis in arterial hypertension. Solitary papilloretinitis. *Presse Méd.*, 1944, April 22, pp. 113-114.

In the great majority of cases a retinopathy or edematous or exudative papilloretinitis in a hypertensive individual is a sign of the most serious prognostic significance. Occasionally,

however, the sign regresses and the individual may survive over a period of years. Three such cases are reported, two of them still living after five years and one dead after seven years.

Phillips Thygeson.

Riser, P., Couadau, and Signeuric. Carotid sinus and retinal circulation. *Presse Méd.*, 1945, March 31, pp. 161-162.

In a study based on the simultaneous determination in fifty subjects of the minimal retinal arterial pressure and the humeral arterial pressure, the results of (1) digital compression of the carotid sinus region, (2) inhibition of the sinus by novocaine, and (3) compression of the carotids below the sinus, were investigated. Unilateral compression of the sinus region in old arteriosclerotic patients occasioned a fall of general arterial pressure, particularly the systolic, with bradycardia continuing for several seconds after the compression was relieved. The diastolic retinal arterial pressure underwent a simultaneous fall proportionate to that of the humeral pressure. The phenomenon was identical in the two eyes. In the return to normal the brachial pressure most often preceded the retinal. In two hyperreactive subjects it was possible by light compression, insufficient to interrupt the carotid flow, to produce syncope, at which time the retinal pressure fell to zero. Bilateral compression produced the same effect.

In three hypotensive unilateral subjects inhibition of the sinus was obtained by regional infiltration with novocaine. A marked rise in pressure lasting up to fifty minutes was noted in both upper extremities, and a 50-percent rise in diastolic retinal arterial pressure occurred and lasted at least eight minutes longer than the brachial

rise. Bilateral inhibition of the sinus produced the same effect except that the amplitude of the hypertension was increased.

Compression of the carotids below the sinus had a very decided hypertensive effect on the general circulation, lasting as long as the compression. On unilateral compression a drop in homolateral retinal arterial pressure was noted; this tended to rise after several minutes, while on the contralateral side a rise proportional to the general rise occurred and was maintained. Bilateral compression led to a considerable drop in retinal pressure without visible changes in the retinal arteries.

The authors stress the fact that important modifications of pressure may occur without visible change in the caliber of the retinal vessels. They conclude that the hypotensive effect of compression on the retinal arteries can be explained by a drop in blood volume and that the sinus had no action on the retinal circulation which was not shared by the general circulation.

Phillips Thygeson.

Weekers, Roger. Retinal functions in the late concussion syndrome. *Presse Méd.*, 1944, May 20, p. 150.

In the course of a systematic study of retinal functions in head-injury cases having a late concussion syndrome, a pathologic enlargement and increase in density of angioscotomata was noted. This finding, not before described, indicates an alteration in retinal circulation and is considered to be of value in the diagnosis and prognosis of the syndrome. Contraction of the isopters of the peripheral field is derived from the same cause but is apparent only in particularly severe cases. Systematic study of the peripheral, medial, and internal isopters also

gives valuable information as to the severity and progress of the condition. Reduction of central visual acuity is exceptional and occurs only in extremely severe cases in which enlargement of the angioscotomata involves the central portion of the retina. Dark adaptation of the macular and perimacular retina is normal except in severe cases in which visual acuity is reduced.

Phillips Thygeson.

## 11

### OPTIC NERVE AND TOXIC AMBLYOPIAS

Charlin C., Carlos. Optic neuritis during lactation. *Arch. Chilenos de Oft.*, 1944, v. 1, July-Aug., pp. 6-11.

After one month of lactation, a woman aged 27 years developed acute bilateral retrobulbar iritis. The vision two months later was reduced to right 1/50, left 1/40. There had been no ocular disturbance during pregnancy. Roentgenography of the chest showed fibrosis of the upper third of each lung. In the course of three months following childbirth the patient had lost seven pounds. According to her own statement, her visual trouble had begun after an intestinal infection with vomiting, diarrhea, and fever, but lasting only two days. Weaning was ordered and the vision and general condition began to improve. One year later the vision is said to have been normal.

W. H. Crisp.

Hart, J. L. Quinine amblyopia with spontaneous detachment. *Brit. Jour. Opth.*, 1945, v. 29, July, pp. 375-376.

Severe quinine toxic amblyopia with spontaneous detachment and optic atrophy is described in a soldier aged 29 years. He had been ill with general malaise, headache, and anorexia for



three days. His temperature was 101° and pulse 105. A diagnosis of malaria was made because the spleen was enlarged. The quinine dosage is not specified. A blood slide was negative for malarial parasites. The temperature rose to 104° and the patient became mentally confused. The following day he became deaf and the pupils became dilated and fixed.

The temperature dropped to 98°+ but quinine was continued. On the third day, the temperature was still down, the patient remained confused, and the pupils remained dilated and fixed. Quinine was stopped and mepacrine was begun, and the patient transferred to a general hospital. Nine days after onset of his illness, fundus examination showed blurred disc margins in the right eye, with extremely small arteries, scarcely visible beyond the disc. The left eye showed pallor of the optic nerve and small arteries as in the right eye. Light perception was denied. Inhalation of amyl nitrate had no effect on the caliber of the vessels.

Two days later, the left retina was seen to be detached above the nerve head. No hole was made out. Thirteen days after onset of symptoms and commencement of quinine, the right eye counted fingers at 1 meter. The field was restricted to fixation and there was loss of color vision. The pupil was very sluggish and the disc was pale. The left eye could vaguely perceive light. The disc was paler than the right. The vessels and detachment were as before.

The possibility of a diagnosis of retrobulbar neuritis occurring in acute encephalitis is mentioned, but the history of quinine administration (probably 60 to 90 grs. in all), the deafness, the contracted fields, and the vascular changes favor the diagnosis of quinine amblyopia. Edna M. Reynolds.

Soto Romay, R., and Nogues, A. E. Gravidic toxicosis with intracranial hypertension and optic neuritis. Therapeutic abortion. *La Semana Méd.*, 1945, v. 52, May 10, pp. 805-810.

The picture of intracranial hypertension and optic neuritis, with marked reduction of visual acuity, appeared in the first half of pregnancy, in a woman of 25 years. Cure resulted from abortion provoked by intra-amniotic injection of formalin. (4 figures, references.)

W. H. Crisp.

Tang, Pei-Ching. Retrobulbar neuritis in Chengtu. *Chinese Med. Jour.*, 1945, v. 63A, Jan., p. 83.

A study of 52 cases of retrobulbar neuritis is reported. The etiology of this disease in China appears to be somewhat different from that in other countries. Not one of the cases studied in this group showed multiple sclerosis, which is certainly by far the most common cause of retrobulbar neuritis in the United States. Twenty-six cases or 19.2 percent were due primarily to infected tonsils. Maxillary sinusitis and ethmoiditis were causative factors in six cases. One case was due to tuberculosis, one to syphilis, one to dietary insufficiency, and one to dental infection. Etiologic factors remained obscure in the great majority of cases.

All the patients complained of impaired vision for both near and distance. Relative scotoma was present in 21 eyes. There were only three cases of positive scotoma. In 44 cases there was a history of gradual onset of symptoms in both eyes at the same time. Sudden onset of symptoms in both eyes occurred in five cases. Thirty-two eyes showed definite fundus changes (hyperemia or optic-nerve pallor). Four cases of long duration showed optic-nerve atrophy. Fundus

findings were normal in the remainder.

Out of 15 cases receiving fever therapy, seven showed definite improvement in vision. Ethmoidectomy was also followed by improvement in vision in several cases. (12 tables, references.)

Edna M. Reynolds.

Voisin, J., and Aurenche, A. Optic neuritis in the course of leptospirosis icterohemorrhagica. *Presse Méd.*, 1945, April 7, p. 174.

Uveitis and optic neuritis are well-recognized complications of this disease but the generally accepted view that they are always benign is not justified. The authors state that there are three forms of optic neuritis which can be recognized in routine fundus examination during the course of the disease. The most benign type is the most frequent, gives rise to no functional disturbance, and appears as a mild hyperemia and edema of the papilla with occasionally a slight exudate into the vitreous. In the second but less frequent type a typical optic neuritis occurs, with an appreciable drop in visual acuity and contraction of the visual fields; healing takes place within two or three months. The third type is relatively severe and shows marked modifications in the vessels leading to secondary optic atrophy with permanent field changes and lowered visual acuity. In some cases blindness has resulted. Severe complications are sufficiently frequent to warrant serious consideration. Phillips Thygeson.

## 12

### VISUAL TRACTS AND CENTERS

Figueiredo, P. N. de. Again ocular symptoms of hysteria. *Rev. Brasileira de Oft.*, 1945, v. 3, June, pp. 215-217.

An aeronautic mechanic 24 years of

age lost the vision of the right eye. He produced hemiptosis by lowering the left eyebrow. But, in the dark room, energetic manipulation and persuasion permitted sufficient examination to show that the left eye was normal. The patient made out that the eye had no vision in the normal position of the head yet could read 20/30 with the head inclined to the right and the eye half closed; but that with the head inclined to the same extent in the opposite direction the eye saw nothing except that the letter card was completely red. It appears that a cure was finally effected by means of convulsive shock.

W. H. Crisp.

Popov, M. Z. The eye syndrome in the cerebral commotion-contusion syndrome. *Viestnik Oft.*, 1943, v. 22, pt. 5, p. 37.

Pure cerebral commotion is rare even in wartime because, while the explosion giving rise to it may occur 2 to 4 meters away, the soldier usually falls to the ground, and direct cerebral contusion results. Hence the term commotion-contusion syndrome is used. The eye findings within five to ten days among seventy soldiers were: vertical nystagmus, sluggish pupillary reaction, and complaints of diplopia, asthenopia, and photophobia. In the fundus were seen hyperemia of the nerve head, without blurring of the margin, and dilatation and abnormal tortuosity of the veins. Injury of the hypothalamus, as well as other mechanical and physiologic intracranial disturbances, is assumed.

M. Davidson.

Rouquier, A. Contraction of the visual field and amblyopia from head injuries. *Presse Méd.*, 1945, Feb. 10, p. 71.

Concentric contraction of the visual

field without central scotoma is very frequent in cranial injuries. It is more often bilateral but is generally much more marked on the side of the lesion. Occasionally it is unilateral on the homolateral side. The amblyopia which frequently accompanies these changes is likewise more marked on the side of the lesion. It may appear several years after the traumatism, particularly in individuals carrying projectiles which are apparently well tolerated. It appears probable that the visual field changes and the amblyopia belong to the group of late reflex disturbances which includes such conditions as late contractures of limbs, and neurologic disturbances in amputation stumps. The medicolegal importance of this type of lesion, which must be sharply distinguished from psychoneurosis, is stressed.

Phillips Thygeson.

Weekers, Roger. Retinal functions in the late concussion syndrome. *Presse Méd.*, 1944, May, p. 150. (See Section 10, Retina and vitreous.)

Wybar, K. C. Branch thrombosis of middle cerebral artery. *Brit. Jour. Ophth.*, 1945, v. 29, July, pp. 355-360.

A case of thrombosis of the parietotemporal branch of the left middle cerebral artery is reported. The patient, a woman aged sixty years, experienced a severe left-sided headache associated with a defect of the right side of each visual field and a tendency to make mistakes in the use of spoken words. During the previous five years, the patient had at various times been conscious of a smoky smell, associated with a dulling of taste sensibility. Her father and grandfather had both died of cerebral hemorrhage.

Physical examination revealed no abnormality apart from the eye condi-

tion. Blood pressure was 160/90 mm. Hg. Corrected vision was 6/24 in each eye. There were marked arteriosclerotic changes in the vessels but no hemorrhage or exudate was observed. The field of each eye was full except that in each eye there was a right superior homonymous quadrantic scotoma adjacent to the fixation point, the left scotoma larger than the right. This field defect persisted with slight fluctuations over a period of some months.

The pathologic process affected selected fibers of the ventral portion of the geniculocalcarine pathway, causing a permanent scotoma adjacent to the fixation point but not extending through the whole visual quadrant. In the early stages associated edema temporarily affected neighboring fibers. (1 table, fields, references.)

Edna M. Reynolds.

### 13

#### EYEBALL AND ORBIT

Chan, Eugene. Actinomycosis of the orbit. *Chinese Med. Jour.*, 1945, v. 63A, Jan., p. 98.

A male patient aged 58 years gave a history of a red, painful nodule of 5-years duration in the right lower lid. The nodule had ruptured, blood and pus draining into the nostril. Later the nodule increased in size again and the patient could not open the right eye. Ulceration then appeared on the skin of the lower lid. Smears of the discharge from the ulcerated lesion showed the presence of knots of mycelium with radially projecting tips. Excised tissue from the tumor appeared studded with many white and yellow dots. Microscopically, the tumor was made up of inflammatory tissue infiltrated with lymphocytes, leucocytes, and epithelioid and giant cells.

The patient disappeared, after three-weeks hospitalization, so that the case was not followed up. The literature is reviewed and the rarity of actinomyco-sis in China is mentioned. (Refer-ences.)  
Edna M. Reynolds.

Dobyns, B. M. The influence of thyroidectomy on the prominence of the eyes in the guinea pig and in man. *Surg., Gynec., and Obstet.*, 1945, v. 80, May, p. 526.

The author has devised an improved caliper-method and a camera-lucida technique for more accurate observa-tion of the prominence of eyes in guinea pigs. Total thyroidectomy was performed on 13 guinea pigs. The au-thor has observed 233 patients on whom subtotal thyroidectomy was per-formed. Increased prominence of the eyes was noted both in the experi-mental animals and in the patients. Among the patients correlation was detected between the fall in metabolic rate and the increase in prominence of the eyes. But neither the presence of thyroiditis, nor the weight of the thy-roid tissue removed, nor the presence of preoperative exophthalmos, nor the presence of intraglandular hyperplasia had any correlation with the changes in prominence of the eyes in the pa-tients on whom a subtotal thyroidec-tomy had been performed.

R. Grunfeld.

Eggers, Harry. A new type of enu-cleation implant. *Amer. Jour. Ophth.*, 1945, v. 28, Sept., pp. 1015-1017. (1 fig-ure, 1 reference.)

McKay, E. D. New technique in orbit reconstruction following radical sur-gery. *Amer. Jour. Ophth.*, 1945, v. 28, Sept., pp. 1017-1018. (1 figure.)

Martini Z., Italo. Intraorbital hydatid cyst. *Arch. Chilenos de Oft.*, 1944, v. 1, July-Aug., pp. 17-22.

A married woman of twenty years, without significant history as to gen-eral condition, developed severe pain in the right eye, accompanied by red-ness of the eye and gradual swelling toward the internal angle. In the course of a few months exophthalmos and conjunctival chemosis became extreme, although the pain diminished. X-ray pictures showed enlargement and de-formity of the right orbit, but without destruction of the walls except in the region of the lamina papyracea. Sudden exacerbation demanded immediate ac-tion. Through an incision along the base of the lower lid, with exposure of the orbital wall, the cyst was pene-trated with a needle at the point of greatest prominence, and 35 c.c. of transparent liquid was evacuated, the withdrawal being followed by injection of 8 c.c. of 2-percent formalin solution which was allowed to remain for five minutes in the cystic cavity. Collapse of the cyst upon withdrawal of this fluid would have rendered extraction of the membrane difficult, but the needle was allowed to remain in place, and served as a guide to incision into the cavity of the cyst. The internal wall was found lined with the germina-tive membrane, which had a "very characteristic" white hyalin appear-ance, and was separated quite easily from the surroundings. Floating in the flask of formalin solution the cyst was of the size of a small hen's egg. During the next few days the patient had a febrile reaction, a cloudy serous fluid escaped between the sutures, and the edema resulting from the operation and injection extended down the cheek and even to the neck, where some

swollen glands appeared. Complete closure of the wound occupied almost two months. The patient failed to return for further examination. As the most important foundation for successful operation in such a case the author emphasizes maintenance of contact with the cyst, a precaution which is impossible if the cyst is emptied by means of a simple puncture. The assistant should never abandon his hold on the needle or withdraw it. (1 photograph, 1 drawing.) W. H. Crisp.

Sverdlick, J., and Luis Fernández, L. **Orbital reconstruction by the Esser-Wheeler technique.** *La Semana Méd.*, 1945, v. 52, July 26, pp. 142-144.

The method here briefly reviewed is that of the use of a dental "stent," around which is wrapped a free transplant of skin of intermediate thickness, after complete removal of scar tissue down to the periosteum. (1 illustration, references.) W. H. Crisp.

#### 14

#### EYELIDS AND LACRIMAL APPARATUS

Florey, M. E., McFarlan, A. M., and Mann, I. **Report of 48 cases of marginal blepharitis treated with penicillin.** *Brit. Jour. Ophth.*, 1945, v. 29, July, pp. 333-338.

The bulk of the cases treated had reached a chronic stage, only five having a history of less than two months duration. All but seven cases were examined bacteriologically before treatment began. Thirty-nine showed staphylococcus aureus and two staphylococcus albus.

The treatment was carried out by the patients. Each was given a weekly supply of ointment containing 600 to 800 Oxford units per gram. Instructions were to keep the ointment covered

in a cool place, and to apply a small quantity of ointment to the lid margins with a wooden probe, rubbing it in with the latter. When possible, this treatment was carried out three times a day, and always before retiring.

The final criterion of recovery was complete disappearance of staphylococcus aureus from swab cultures. This was considered the safest insurance against relapse. All patients except one reported alleviation of symptoms. This was noticed by some within 24 hours, and by the end of a week 33 cases showed improvement.

Clinical recovery took place in 36 of the cases. Bacteriologic recovery was registered in 24 of these, some accident preventing final examination of the 12 others. In 11 cases, though alleviation of symptoms occurred, treatment was not carried through till they could be listed as fully recovered. No improvement was reported by one patient who had a refractive error and whose bacteriologic cultures showed the presence of staphylococcus albus only (coagulase negative.)

Three to six weeks time was required for recovery. Some infections recurred one or two weeks after cessation of treatment, even when this had been continued till after staphylococcus aureus had disappeared from the cultures. Twenty-four cases were followed up for a year. Two thirds of these had remained free from recurrence without further treatment. It is felt that penicillin ointment offers a hopeful form of treatment for marginal blepharitis. (4 tables.) Edna M. Reynolds.

Hughes, W. L. **Total reconstruction of the upper lid (blepharopoesis).** *Amer. Jour. Ophth.*, 1945, v. 28, Sept., pp. 980-992. (25 figures.)

Lytton, H. Subcutaneous splitting of the lid in the operative treatment of senile ectropion. *Brit. Jour. Ophth.*, 1945, v. 29, July, pp. 378-380.

To avoid splitting the lid margin in the Kuhnt-Szymanowski operation, a method of subcutaneous splitting is suggested. The skin-muscle layer is separated from the tarsoconjunctival layer with angular scissors introduced through an incision at the outer canthus. The splitting is extended up immediately under the lid margin, keeping close to the anterior surface of the tarsus.

Two mattress sutures are inserted into the anterior layer of the lid near its margin. These sutures are used to lift the skin. The tarsal plate is drawn downward and inward by two Snellen sutures. The lateral incision is completed to the excision of the Kuhnt-Szymanowski triangle. The lifting sutures are fastened above the eyebrow and the Snellen sutures are tied in the usual way. (3 diagrams).

Edna M. Reynolds.

Pierose, P., and Butt, E. Edema of the eyelids in trichinosis. *California and Western Med.*, 1945, v. 62, April, p. 174.

So far, the commonly held view that "edema of the eyelids in trichinosis is due to the presence of trichinae in the extraocular muscles" lacks sufficient supportive evidence and must therefore be considered an assumption. The author advances the concept that edema of the eyelids as it occurs in trichinosis may be principally a non-specific toxic manifestation not entirely due to the presence of trichinae in the extraocular muscles or other tissues around the eyes. Two instances of trichinosis of the extraocular muscles

occurring in 11 unselected patients investigated are reported and illustrated. Trichinae were demonstrated in six of the 11 bodies. In none of these patients had clinical symptoms of trichinosis been recorded.

Theodore M. Shapira.

Shimkin, N. I. Two rare cases of homoplastic surgery of the eyelids. *Brit. Jour. Ophth.*, 1945, v. 29, July, pp. 363-369.

In a case of posttrachomatous trichiasis in a hemophiliac youth, grafting with a transplant from the mucosa of the lower lip of the patient was followed by severe hemorrhage, the patient having withheld the information that he suffered from hereditary hemophilia. But it was found that his father's blood would coagulate the patient's blood, and a mucous graft from the father's lower lip was used with success.

In a case of congenital ichthyosis ectropion with all four lids involved in a child aged 13 months, whole-skin grafts from the mother's forearm were placed in the child's lids. In view of the fact that the patient's pulse became arrhythmic during the operation, the grafting of the left lower lid was postponed. Seven weeks after operation the corrected lids were functioning perfectly. (2 figures, references.)

Edna M. Reynolds.

Tinoco, Joaquim. Streptothrix of the lacrimal passages. *Rev. Brasileira de Oft.*, 1945, v. 3, June, pp. 207-209.

The author reports the case of a physician aged 85 years, in whom chronic conjunctivitis had existed for three years. The large mass of concretions evacuated by incision with the

Bowman knife contained streptothrix and other organisms. (References.)

W. H. Crisp.

## 15

### TUMORS

Roethth, Andreas de. Treatment of bilateral retinoblastoma. Northwest Med., 1944, v. 43, Dec., p. 364.

The right eye of a four-year-old girl was removed for retinoblastoma. The left eye showed a flat gray elevation, 5 by 2.5 disc diameters in area, at the macular region, and a second grayish-white protruding mass far in the periphery at the 7-o'clock position. By roentgenography three small kidney-shaped chalky-white areas were shown within the detachment. The patient was sent for X-ray treatment, and received 15,200 r equally divided between the temporal and nasal portals. The calcium foci steadily increased during treatment, and there are now 12 foci present. An area of choroidal atrophy surrounds the tumor. V. is 20/70.

A second method of treatment is electrocoagulation by Weve's method. The author observed two cases treated by this method. The electrode was introduced through the sclera into the tumor 55 times for two or three seconds each time, using 50 to 60 milliamperes. One case treated by this method was arrested at first but showed advance after five months. The second case was arrested and apparently cured.

R. Grunfeld.

Santos, E. and Deik, S. Radiotherapy in the treatment of retinal glioma. Arch. Chilenos de Oft., 1944, v. 1, Sept.-Oct., pp. 11-14.

In two children, aged respectively four and eighteen months, and in whom one eye had already been enucleated

on account of glioma, the technique recommended by Martin and Reese was resorted to, fractional doses being used in four or five series in the course of a year. The radiation was administered by three portals of entry, temporal on the same side and supraorbital and nasal on the opposite side. In the first case, after primary swelling of the tumor, gradual and complete destruction of the tumor was observed, with preservation of vision as demonstrated by the fact that the child walked perfectly and confidently took hold of objects placed in its reach. There was no general or local change attributable to the treatment, and at the age of sixteen months the child weighed thirty pounds. In the second case, in a shorter period of observation, the vision had not changed, complications had not been observed, and after two years of radiation there was definite indication of disintegration of the growth. (3 figures.)

W. H. Crisp.

## 16

### INJURIES

Baltin, M. M. X-ray therapy of traumatic iridocyclitis. Viestnik Oft., 1943, v. 22, pt. 6, p. 6.

On the basis of experience with 24 cases of serious traumatic iridocyclitis, Hessberg's method of treating them is considered justified. Enucleation may always be performed later, if therapy fails. Small doses of medium-soft rays, three or four applications at five or six-day intervals, were found to relieve pain, reduce inflammation, and shorten treatment. The acute early cases fare best, ten of the author's cases having been definitely benefited. Among the cases not benefited were seven with overlooked intraocular foreign bodies. Four of the intraocular foreign bodies

were later extracted, three being amagnetic. Atropine and milk injections were also used. No erythema was produced nor corneal opacities noted. The dosage formula is: 120 kv., 4 ma., 30-cm. focus, 3-mm. Al filter, 50 to 100 r.

M. Davidson.

Bokstein, F. S. The special problems in the diagnosis and therapy of gunshot injuries. *Viestnik Oft.*, 1943, v. 22, pt. 6, p. 11.

Dacryocystitis after gunshot injury of the face is often overlooked, because of the other widespread lesions and the difficulty of making the diagnosis. The writer found it in 24 out of 62 injuries that came under his observation. While the lacrimal passages are normally so well protected that they are not injured in connection with the numerous operations performed on the sinuses or with nasal fractures, they are often injured in gunshot wounds. The fistulous tract sometimes opens into nose or antrum, and a sinus origin is assumed. In one case the fistula opened below the outer canthus, and an osteomyelitic process was simulated. The correct diagnosis was made only after six months, by instilling collargol into the conjunctival sac. The presence of pneumococci and mucus is helpful in the diagnosis. Extirpation of the sac is not effective in these cases, because of the diverticula and ectasias. A rhinostomy is necessary, without the usual sutures and with a large opening into the nose. The sac may be removed at the same time. As long as the lacrimal canaliculi are intact the results are good. Nasal atresia may have to be taken care of first.

M. Davidson.

Crawford, R. A. D. Repair of perforating corneal wounds. *The Lancet*, 1945, March 24, p. 366,

Direct suturing of the corneal wound is preferable to covering the wound with a raised conjunctival flap. Corneal suture gives a firmly healed scar with a low degree of astigmatism. Rapid restoration of the anterior chamber reduces the incidence of anterior synechia, and inflammation is minimal and the prognosis easy to assess. There is no risk of late infection. A large conjunctival flap, however, causes the eye to remain red and irritable for a long time, and it is difficult to judge whether the irritation is due to the injury or to the operation. If retraction of the conjunctival flap is delayed, observation of the cornea is difficult.

R. Grunfeld.

Fisher, J. A. Severe laceration of only eye with recovery of useful sight. *Amer. Jour. Ophth.*, 1945, v. 28, Sept., pp. 1014-1015.

Ivanova, E. M. Case report of late tetanus. *Viestnik Oft.*, 1943, v. 22, pt. 5, p. 38.

In the literature 83 cases of tetanus observed after eye injury are reported. This condition is presumably due to encapsulation of spores. The case now reported is of hydrochloric-acid burn in 1924 which left the worker blind with bilateral symblepharon and ankyloblepharon, for which plastic operations were undertaken in 1939, preliminary to keratoplasties, and in which tetanus followed radical plastic operation. The patient recovered. Notable among the symptoms, and also reported in connection with similar cases in the literature, is the occurrence of facial weakness and oculomotor paresis before and synchronous with the convulsive seizures.

M. Davidson,



Kolen, A. A. A few methods of plastic surgery in war injuries of the eyes. *Viestnik Oft.*, 1943, v. 22, pt. 6, p. 3.

The most frequent plastic operation around the eyes is that on the lids, and the most serious problem is their reconstruction. The Filatov round pedicled skin-flap is suitable for the repair of very large defects combined with osseous destruction, but is complicated and long-drawn out, because of the long series of transmutations it often has to undergo. It also requires a very large flap to insure its viability. A modification of this flap is here described under the name of "microflap." It is taken from the face and is only about one-half inch wide. Its length is outlined in two equal segments, displaced with reference to each other, so that instead of the flap being rolled and sutured lengthwise, as in the original Filatov method, the two segments are folded against each other, by first sectioning the peripheral end of one, and are sutured side to side to make a roll. The denuded area is thus narrower and the sutures do not tear out so readily. For restoration of the lower lid the flap is made longer than necessary to fill the gap, and the two ends are denuded of epidermis and slipped through a tunnel at one end and into a pocket at the other end of the gap. This provides for securer fixation of the new lid. A method described for correcting the milder cicatricial ectropions is said to tend to prevent recurrence by pull of the new scars. It consists in shaping the two triangles of Limberg so that their sides are very convex downward. The upper triangle is slid into place and its apex brought up to the dorsum of the nose. A third procedure is described for raising or lowering displaced canthi. (Illustrated).

M. Davidson.

Kolen, A. A. Some points in the conservative and surgical treatment of war injuries of the eyes. *Viestnik Oft.*, 1943, v. 22, pt. 5, p. 14.

Experience at the Novosibirsk Evacuation Hospital Eye Clinic is summarized as follows: Enucleation and evisceration are the most common eye operations in war. Retrobulbar anesthesia for evisceration is dangerous in view of the most common indications for it, namely panophthalmitis. Direct injection into the ciliary body, 1 to 1.5 mm. from the limbus, guiding the needle obliquely backward and penetrating 1 to 1.5 mm. at both the 3 and the 9-o'clock positions, has been found very satisfactory. Ablation of the cornea is best done 1 to 1.5 mm. beyond the limbus, and instead of a Bunge spoon a spatula is used for separation of the contents from the sclera. In dealing with nervous injured soldiers 1-percent novocaine has been found too weak, and a quantity as high as 8 to 10 cc. of a 2-percent solution is necessary for enucleation. The pain of muscle section due to traction has been obviated by using a strabismus hook with an inner cutting edge extending 18 mm. from the tip, and severing insertions by a see-saw motion, without forceps or scissors. Vitreous opacities have greatly benefited from blood transfusion combined with simultaneous puncture of the anterior chamber, and the effect observed has been much better than from blood transfusions alone. On the other hand, the presence of iridocyclitis is a contraindication to paracentesis, and blood transfusion alone is indicated in such a case.

M. Davidson.

Kolychev, N. N. Kuhnt's keratoplasty in war injuries of the globe. *Viestnik Oft.*, 1943, v. 22, pt. 5, p. 44.

In reviewing the material at an evacuation hospital in 1939, the author found that, because of unfavorable conditions for making an accurate examination in the field, intraocular foreign bodies had been retained in 14 out of 42 perforating globe injuries in which a Kuhnt operation had been done. In nine of these cases the foreign body was removed at an evacuation hospital; three by the anterior route and six by the posterior route. Of the eyes operated upon, three had to be enucleated, and one eviscerated. Of the eyes retained, the majority had useful vision, so that the operation is considered as having accomplished a useful purpose. M. Davidson.

Newson, A. L., and Armstrong, K. B. A case of burns associated with bilateral retinitis. *Med. Jour. Australia*, 1945, v. 1, May 5, p. 459.

A soldier received an extensive second-degree burn by accidental ignition of low-octane gas. Toxic symptoms developed on the second and third days. On the second day of illness the patient complained of blurred vision, and this persisted. When the vision was tested two weeks later he could count with each eye merely fingers at four feet distance. In each eye the macula was surrounded by a large white area somewhat similar to that seen in malignant hypertension. In the center of the area was a dull-red spot. Five to six smaller patches were scattered over the posterior portion of each fundus, but only one small hemorrhage was seen. A month later vision had improved to 6/36 in each eye. The peripheral patches had been largely absorbed and those around the macula were in course of absorption.

R. Grunfeld.

Preobrajenskaya, M. N. A survey of the nature of eye injuries in the present war. *Viestnik Oft.*, 1943, v. 22, pt. 6, p. 17.

A plan, with tabulating cards and report forms, is proposed for statistical analyses of eye injuries by the Helmholtz Central Ophthalmologic Institute. In the meantime, on the basis of three hundred cases analyzed at the evacuation hospital of the Institute, where the injured are received one to three months after injury, results are stated as follows: 33 percent, with anophthalmos, came in for plastic work; 17 percent came in with intraocular damage, mainly from contusion; 13.6 percent with iridocyclitis due to perforating injury; 7.5 percent with atrophied globes for enucleation and prosthesis; 5.4 percent with leucoma; 6.5 percent with intraocular foreign bodies for extraction; the rest not specified. The statistics for the field hospitals and stations are of course different. Most of the eye injuries are the results of mine explosions. Bullets account for 20 percent only. Isolated eye injuries are rare, being less than half of the total. Perforating injuries are more common in this war than in the previous one. Bilateral eye injuries are also more common.

M. Davidson.

Rosen, Emanuel. An unusual type of anterior traumatic capsular cataract. *Brit. Jour. Ophth.*, 1945, v. 29, July, pp. 373-374.

Anterior traumatic capsular cataract followed a penetrating injury. The anterior capsule of the lens presented an elongated white scar from which several folds radiated. The question is raised whether these radiating folds were merely wrinkles in the hyaloid membrane or epithelial proliferation

upon the lens capsule. (2 slitlamp photographs.) Edna M. Reynolds.

Rosen, Emanuel. Traumatic lenticonus posterior. *Brit. Jour. Ophth.*, 1945, v. 29, July, pp. 370-373.

Two cases of traumatic lenticonus posterior are reported. Case 1 followed a penetrating injury. A dense white deposit was seen in the posterior cortex, as well as many small white round salt-like deposits very much resembling stars in the sky. The posterior capsule seemed to bulge posteriorly and the vitreous also seemed to partake of the star formation.

In case 2, the center of the posterior capsule of the lens also showed prominent bowing posteriorly. In this case, the posterior capsule appeared to be rolled up upon itself in two regions and gave the appearance of glasslike tubings. It is possible that in this case trauma produced a process similar to lamellar separation, allowing the capsule to roll up on itself and the region between the "tubes" to herniate because of its lack of resistance.

A third case of traumatic lenticonus posterior is mentioned but could not be photographed. (3 slitlamp photographs, references.) Edna M. Reynolds.

Rychener, R. O. The management of traumatic hyphemia. *Sec. on Ophth. Amer. Med. Assoc.*, 1944, 94th mtg., pp. 38-43.

Citing briefly a number of illustrative cases, the author suggests that traumatic hyphemia may frequently be controlled by simple paracentesis of the cornea, without irrigation of the anterior chamber. Miotics are possibly more beneficial than mydriatics. Paracentesis should be used without delay in the presence of an increase of intraocular pressure, or when no clear

aqueous is visible in the anterior chamber. (References.) W. H. Crisp.

Thorpe, H. E. Nonmagnetic intraocular foreign bodies. *Sec. on Ophth. Amer. Med. Assoc.*, 1944, 94th mtg., pp. 87-107.

The subject is reviewed thoroughly under the headings of history, clinical examination, X-ray localization, the Berman locator, preparation of the patient for surgery, cornea, anterior chamber, chamber angle, iris, lens, foreign body in posterior aqueous chamber, nonmagnetic particle in ciliary body, foreign body in vitreous, vitreous approached by various methods, scleral foreign bodies, and sympathetic ophthalmia. The number of nonmagnetic foreign bodies encountered both in industry and in warfare has increased.

The author favors Comberg's contact-lens method of X-ray localization, which he has recently modified by the drilling of suture holes near the edge of the glass, so that it may be anchored with episcleral sutures. Surgical details are given for removal of foreign bodies in various parts of the eye, including the author's instrument for endoscopic removal of intravitreal nonmagnetic foreign bodies. Emphasis is laid on the necessity for avoiding mutilation of the eye in the attempt to remove a foreign body which might prove inert and harmless. (14 drawings.)

W. H. Crisp.

Whitsell, F. M. Treatment of ocular injuries among combat troops. *Texas State Jour. Med.*, 1945, v. 40, April, p. 646.

This is a review of recent literature. Topics dealt with include the use of a conjunctival flap to cover a perforated cornea, delayed absorption of anterior

or posterior hemorrhages, intraocular nonmagnetic foreign bodies, and thermal and chemical burns.

R. Grunfeld.

# 17

## SYSTEMIC DISEASES AND PARASITES

Jones, I. H., Muckleston, H. S., Lewis, E. R., and Owen, G. R. Vitamins and the eye, ear, nose, and throat. *The Laryngoscope*, 1944, v. 54, Nov., pp. 628-657.

This is a survey on the subject of vitamins and related problems in general and local metabolism. Any gross deficiency gives obvious signs, as in pellagra. To detect moderate deficiency, however, the clinician must depend on more or less indefinite signs plus laboratory findings. Each germ layer demands an oil-soluble or a water-soluble vitamin. The ectoderm and the endoderm require A and B complex, the mesoderm requires C and D vitamins. This concept affords a rational approach to therapy.

When raw material is assimilated by the cell it becomes living tissue under the influence of activators, intrinsic activators which are the endocrines, and extrinsic which are the vitamins. Cod-liver oil was found to heal keratomalacia, showing that the corresponding vitamins are important in the metabolism of cornea. Cataract appears in rats as a result of diet deficient in B<sub>2</sub>. In the retina, deficiency of C, K, or P vitamin will produce capillary hemorrhages.

Experience with 97 patients suggests that lack of B<sub>2</sub> is the cause of vernal conjunctivitis. M. Lombardo.

Liang, S. C. Thelaziasis of the conjunctiva. *Chinese Med. Jour.*, 1945, v. 63A, Jan., p. 70.

A case of invasion of the conjunctiva by thelazias, a genus of nematodes allied to the filarias, is reported in a 24-year-old Chinese male. He had no subjective symptoms and the discovery of the nematodes was accidental, in the course of a routine examination. A body resembling a mass of discharge was seen moving in the lower conjunctival fornix. Six worms were easily extracted, averaging 10 to 15 mm. in length. The source of infestation was not determined but was probably either canine or feline. (References.)

Edna M. Reynolds.

Martini Z., Italo. Intraorbital hydatid cyst. *Arch. Chilenos de Oft.*, 1944, v. 1, July-Aug., pp. 17-22. (See Section 13, Eyeball and orbit.)

Messinger, H. C. Eye signs in two hundred diabetics. *Rhode Island Med. Jour.*, 1944, v. 27, Dec., p. 643.

Among two hundred diabetics, 49 men and 151 women, who came for relief of symptoms referred to the eyes, the majority had retinal defects, 86 had cataract, 8 had muscle paralyses, 9 had glaucoma, and one had melanoma of the choroid. The average age was 61 years, but there were 11 persons less than 40 years old. Five had only refractive errors. Four had severe retinal hemorrhage with considerable loss of visual acuity; one had subcapsular cataract; and one had interstitial keratitis due to congenital syphilis, with a 4+ Wassermann. R. Grunfeld.

Pierose, P., and Butt, E. Edema of the eyelids in trichinosis. *California and Western Med.*, 1945, v. 62, April p. 174. (See Section 14, Eyelids and lacrimal apparatus.)

Reeh, M. J. Ocular complications of

certain tropical diseases. *Amer. Jour. Ophth.*, 1945, v. 28, Sept., pp. 958-964. (6 figures, references.)

## 18

HYGIENE, SOCIOLOGY, EDUCATION,  
AND HISTORY

Bushnich, D. G. Organization of mass rehabilitation of potential recruits. *Viestnik Oft.*, 1943, v. 22, pt. 6, p. 23.

In spite of previous efforts by the Soviet Government to eradicate trachoma among the children in Turkmenia, a high incidence of it was still found among the youth subject to the draft. Organized efforts to reach the cases were started in 1932, but until 1937 only about 10 percent of the trachomatous were cured. In 1937 a new procedure including educational-curative centers with hospital beds for intensive treatment, by the Filatov method of expression every two weeks, was found very effective, and 70 percent of the cases were cured by 1942. There were 16 such centers with 1,300 beds. In one center 90 percent were thus cured. Between expressions, daily local massage was employed with varying agents. Many of the centers paid for themselves by the occupational therapy in the form of gardening. Political indoctrination was also a part of the two to three months concentration program. The assembling of the youth was facilitated by use of a special medical passport on which treatment and results were noted.

M. Davidson.

Chan, Eugene. A statistical study of trachoma among in-patients. *Chinese Med. Jour.*, 1945, v. 63A, Jan., p. 93.

Statistical data on the incidence and

sequelae of trachoma among 1,025 in-patients of the Chengtu Eye, Ear, Nose, and Throat Hospital for 1938 and 1939 are presented. The high incidence of keratitis as well as trichiasis and entropion in stage-III trachoma is brought out. Trichiasis and entropion were found to occur bilaterally in the majority of cases. Trachoma occurred in 32.2 percent of the patients. (11 tables.)

Edna M. Reynolds.

Chi, Hsin-Hsiang. A statistical study of trachoma among in-patients. *Chinese Med. Jour.*, 1945, v. 63A, Jan., p. 73.

Among 2,903 patients admitted to the Department of Ophthalmology of the Chengtu Eye, Ear, Nose, and Throat Hospital from January, 1940, to December, 1943, 44.9 percent had trachoma. The highest incidence of infection occurred in the age groups between 16 and 40 years. The majority of patients had trachoma III and over 80 percent showed corneal lesions. (8 tables, references.)

Edna M. Reynolds.

Perret, A. Ophthalmology in Venezuela. *Amer. Jour. Ophth.*, 1945, v. 28, Sept., pp. 1018-1020. (References.)

Shen, D. S. Investigation of blindness in West China. *Chinese Med. Jour.*, 1945, v. 63A, Jan., p. 62.

An analysis of 1,130 blind eyes in 748 patients investigated during a four-year period is presented. Trachoma was responsible for blindness in 438 eyes. Ulcerative keratitis from various causes caused blindness in 158 eyes. Thirty-one of these eyes also had trachoma. Keratomalacia was the cause of blindness in 51 patients (90 eyes), the majority being in children under ten years of age. Only six patients were adults.

Gonorrheal infection was responsible for blindness in one hundred eyes, many babies having been delivered by untrained midwives. Small-pox and hereditary defects are not frequent factors in the causation of blindness in West China. (2 tables, references.)

Edna M. Reynolds.

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## ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Haden, H. C. Concerning the similarity of the developing retina and brain wall in human embryos. *Amer. Jour. Ophth.*, 1945, v. 28, Sept., pp. 943-957. (19 photographs, references.)

## PAN-AMERICAN NOTES

Edited by DR. M. URIBE TRONCOSO  
500 WEST END AVENUE, NEW YORK 24

Communications should reach the Editor by the Twelfth of the month

### MISCELLANEOUS

*Mexico.* The Association for the Prevention of Blindness in Mexico held its second annual "Ophthalmological Week" from August 13th to 18th. The meetings were held in the hospital which the Association maintains in Mexico City. Clinical demonstrations and operations were also held.

United States of America Project of the National Research Council.

The present war has intensified the problem of obtaining the indispensable material for research work for the scientists of the American Republics. Transportation of this material has become very costly and even impossible.

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### SOCIETIES

*Argentina.* The Argentine Society of Ophthalmology held a meeting on July 18th at which the following papers were read and discussed: "Diagnosis of the earlier symptoms of glaucoma" by Drs. Flaminio Vidal and Jorge L. Malbran; "A dynamic ophthalmotonus and ocular trauma" by Drs. Flaminio Vidal and Moises Bradsky; "Disturbances of the hypophysis and their treatment by the gonadotro-

phine from serum" by Dr. Justo Lijo Pavia; "Three cases of congenital aniridia" by Drs. J. Lijo Pavia and Rodolfo Lachman.

*Mexico.* The Mexican Ophthalmologists Society appointed the following members to the board of directors of the Society for this year: Dr. Pedro Berrneco, president; Dr. Carlos Tapia, secretary; Dr. J. Martinez Hinojosa, treasurer.

#### PERSONALS

*Brazil.* Dr. R. Busacca of São Paulo, Brazil, gave a course on the premises of the Argentine Society of Ophthalmology in May. The subjects were: "Pathology and clinical manifestations of corneal diseases." One lesson was devoted to corneal lesions due to the epitheliotropus virus.

The Moura Brazil Prize for 1944 was awarded to Dr. Francisco Amendola, of São Paulo, for his work on "Ocular pemphigus."

The prize, "Sociedade de Oftalmologia de São Paulo," instituted some years ago by Prof. Moacyr E. Alvaro, was awarded for the first time this year. It is to be awarded annually to the physician who, having graduated from medical school the previous year, has shown the greatest ability in ophthalmology. The 1944 prize was awarded to Dr. Rubens Belfort, de Mattos.

The prize, "Presidente de Sociedade de Oftalmologia de São Paula" is awarded yearly to the author or authors of the best papers pre-

sented at the monthly meetings of the Society. This year it was unanimously decided to divide the prize into two equal parts, one to be awarded for the best review on a subject and the other for the best paper on research. The first was given to Dr. J. Mendonca de Barros for his papers on "Ocular tuberculosis" and "Arterial hypertension as related to ophthalmology." The prize for research went to Dr. Antonio de Almeida for his papers on "The examination of the fundus oculi in newborn infants as an aid to diagnosis" and "Orbital tumors."

Dr. Silvio Abreu Fialho, of Rio de Janeiro, was elected a member of the National (Brazilian) Academy of Medicine.

*Guatemala.* Dr. William B. Clark, professor of ophthalmology, Tulane University, of New Orleans, Louisiana, has just returned from Yepocapa, Guatemala, where he spent six weeks instituting a research project to study the causes of blindness in patients infected with onchocerciasis in Guatemala. This project is sponsored jointly by the Caribbean Sector of the Pan-American Sanitary Bureau and the Department of Health of Guatemala. The project is being continued in Dr. Clark's absence, by Dr. Bertha Riveroll Noble, of Mexico City, D.F., who was a former Pan-American Kellogg Foundation Fellow in Ophthalmology at Tulane University from 1943 to 1945. Dr. Clark will return to Guatemala in January, 1946, to close out or continue the project as the results of the investigation justify.

## NEWS ITEMS

Edited by DR. DONALD J. LYLE  
904 Carew Tower, Cincinnati 2

News items should reach the editor by the twelfth of the month.

### DEATHS

Dr. Donald A. Bartley, Indianapolis, Indiana, died June 16, 1945, aged 58 years.

Dr. Michael V. Ball, Warren, Pennsylvania, died May 26, 1945, aged 77 years.

Dr. Erastus T. Farrens, Clarinda, Iowa, died June 2, 1945, aged 89 years.

Dr. Clarence F. Fowler, Galveston, Texas, died June 30, 1945, aged 30 years.

Dr. Lawrence C. Ingram, Orlando, Florida, died July 2, 1945, aged 72 years.

Dr. Harry A. Seigall, Hartford, Connecticut, died June 29, 1945, aged 54 years.

Dr. Benjamin F. Steely, Louisville, Illinois, died May 18, 1945, aged 64 years.

Dr. Alonzo C. Ward, Osceola, Missouri, died May 28, 1945, aged 89 years.

### MISCELLANEOUS

The Pan-American Airways System is offering a 15 percent reduction on fares to delegates attending the Pan-American Congress of Ophthalmology meeting at Montevideo.

The fare from Miami to Montevideo is \$486.00 one way; \$874.80 round trip if traveling via the East Coast; \$504.00 one way; \$907.20 round trip if traveling via the West Coast.

For any delegate who may be interested in making a circle trip around South America the fare will be \$891.00.

All these fares are subject to 15 percent U. S. transportation tax. However, as mentioned above, these fares are also subject to 15 percent discount.

### PERSONALS

Among the speakers at the conference on industrial health problems sponsored by the industrial hygiene bureau of the Pennsylvania Department of Health was Dr. Charles F. Kutscher of Pittsburgh. This conference was held September 25th and 26th at the Benjamin Franklin Hotel at Philadelphia. The title of Dr. Kutscher's paper was "Industrial ophthalmology."



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### ABSTRACTS

General methods of diagnosis; Therapeutics and operations; Physiologic optics, refraction, and color vision; Ocular movements; Conjunctiva; Cornea and sclera; Uveal tract, sympathetic disease, and aqueous humor; Glaucoma and ocular tension; Crystalline lens; Retina and vitreous; Optic nerve and toxic amblyopias; Visual tracts and centers; Eyeball and orbit; Eyelids and lacrimal apparatus; Tumors; Injuries; Systemic diseases and parasites; Hygiene, sociology, education, and history .....	1388
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## DENDRITIC KERATITIS ASSOCIATED WITH CHRONIC MALARIA

ROBISON D. HARLEY, MAJ. (MC), A.U.S., AND  
ROBERT F. KAISER, MAJ. (M.C.), A.U.S.  
*Ancon, Canal Zone*

Dendritic keratitis, in association with the acute malarial attack, is well known and has been widely recognized as a manifestation of malaria. The time of occurrence from the malarial attack has been given as 1 to 20 days with the sixth day as an average.

It is the purpose of this paper to report the diagnosis of an otherwise unsuspected malaria from the recognition of a dendritic keratitis. The association of these conditions is certainly not new, but we have been intrigued by the high percentage of positive malarial smears which have resulted from repeated trials when, otherwise, the etiologic agent for this form of keratitis might have been less easily uncovered. In other words, the usual situation has been reversed inasmuch as malaria was diagnosed on the basis of a dendritic keratitis.

In the past 1½ years, 11 cases of dendritic keratitis were admitted to the Eye Service of Gorgas Hospital in which a painful eye was the sole complaint. In eight cases malaria was discovered from two to nine days following admission for the eye complaint. In no case was malaria even suspected by the admitting officer since the temperatures were never more than 99°F. This statement becomes particularly significant inasmuch as the index of suspicion of malaria at this institution is unusually high. Malaria, both tertian and estivo-autumnal, is one of the more

common conditions seen by the Medical Service.

For those who have worked with a large number of malarial patients, it will be realized that the symptomatology of this disease may be nearly as protean in its manifestations as is syphilis. Dendritic keratitis apparently represents another unusual manner in which the disease malaria may be introduced to us.

For the purpose of this paper we are excluding all cases of this form of keratitis which occurred in conjunction with the acute malarial attack. As a complication of the acute attack it usually appears during the first week or even up to the third week following the initial symptoms of malaria.

In seven cases there was a definite history of a previous attack of malaria as far back as a year or more. In not one of these cases was malaria considered as a diagnosis on admission. Careful study of thick and thin blood smears over a period of several days in most instances was necessary before a positive identification of the plasmodium was possible. In two instances even the ordinary smears failed to show the organisms, so that it was necessary to resort to a method to "coax out" the plasmodium into the peripheral blood. As a provocative in the diagnosis of malaria, adrenalin and nicotinic acid were used. Two hundred milligrams of nicotinic acid is given and fol-

lowed in 30 minutes by 3 minims of adrenalin.\* Routine thick and thin smears are taken at the time of the adrenalin injection and then at 60 and 120 minutes after the injection. It has been found that this method is sometimes effective in demonstrating malaria in the blood smear when the ordinary methods fail.

Of the eight cases seen, two proved to be estivo-autumnal, another was tertian and estivo-autumnal mixed, and the remaining five were tertian. That these were not cases of acute attacks of malaria is evidenced by the fact that all of the patients were asymptomatic and either afebrile or registered a temperature no higher than 99°F. during the hospitalization period.

Four of the eight patients had had recurrent attacks of dendritic keratitis three to six months previous to being seen at Gorgas Eye Clinic.

The seasonal incidence of these cases is perhaps less illuminating. Five cases occurred from September to March, which covers the worst part of the wet season as well as three months of the dry season. Three of the cases occurred in June and July. However, since these are admittedly chronic cases, the time of occurrence of the keratitis is probably of little significance.

In the three cases of dendritic keratitis in which malaria was not found, either the teeth or tonsils were suspected of being foci and promptly eliminated. One patient left the Hospital in three days, so that sufficient time could not be devoted to examining his blood smears.

It will be noted that six out of the eight cases were reported as showing the tertian form of the parasite. The relapsing nature of tertian seems to favor the development of a chronic malaria, hence

probably accounts for the high number of keratitides in this particular series.

In addition to the intensive treatment of the malaria and the elimination of foci, our patients received topical applications of iodine syrup (Tr. iodine, glycerine, sat. sol. potassium iodide, and iodine crystals) together with topical atropine and a bandage to the affected eye. In several of the cases which seemed resistant to this form of treatment, vitamin A in the form of carotene and diathermy was added. The time for healing of the keratitis ranged from one week to two months, the average time being four weeks.

No permanent complications were noted except a moderate visual loss when the healed keratitis occurred in the pupillary center of the cornea.

There have been no recurrences of the keratitis in any of the treated patients to date.

No other type of keratitis has been seen in association with malaria either of the acute or chronic form. However, one case of dendritic keratitis was so refractory to treatment that it appeared to develop into a localized deep form of keratitis, but eventually healed.

A transference of the keratitis from the scrapings of a herpetic cornea to a healthy cornea was unsuccessful in two cases.

It is logical to assume, then, that had not the malaria been diagnosed and treated, the corneal lesions would have continued unabated. This fact was brought to light by several patients who had recurrent attacks of dendritic keratitis with a chronic asymptomatic malaria. In cases 2 and 3 and in two other cases not mentioned the patients gave a history of what seemed to be recurrent attacks of dendritic keratitis which cleared up only after the latent malaria had been eliminated.

\* Smear routine as outlined by Maj. R. H. Ralston (MC), Medical Service, Gorgas Hospital.

The cases of dendritic keratitis seen at Gorgas Hospital emphasize the need for a thorough search of the blood smear for malaria on repeated occasions.

The fact that latent or chronic malaria may be completely asymptomatic makes the diagnosis even more challenging. It is to be remembered that malaria will be lurking in the blood of great numbers of our returning forces and the ophthalmologist may very well be the first to suspect its presence with the recognition of this peculiar form of keratitis.

#### CASE REPORTS

*Case 1.* A continental soldier, aged 29 years, was admitted to Gorgas Hospital on March 29, 1943, complaining of pain, lacrimation, and photophobia of the right eye for two weeks. He had been at another Army hospital for the last two weeks with the same complaint. He had been in the tropics for one year and there was a history of malaria, seven months previously, which was treated with quinine. His temperature on admission was 99°F. and remained normal throughout the remainder of his four weeks' period of hospitalization. There was no history of chills or fever nor any other systemic complaint save that referring to the eye. Daily thick and thin smears were examined beginning on March 29th, and on March 30th a positive smear for tertian malaria was reported. The patient was placed on atabrin on this date and his smears continued to be negative thereafter. The cornea of the right eye was treated with topical applications of iodine, atropine, heat, and bandaging. The eye began feeling better in a few days, and the keratitis appeared not to advance, although the lesion did not completely heal for one month.

A case of afebrile, chronic, tertian malaria associated with dendritic keratitis

was unsuspected on admission at two large hospitals.

*Case 2.* A Puerto Rican soldier, aged 32 years, who had been in the tropics all his life was admitted to Gorgas Hospital on January 5, 1944. The chief complaint was pain, lacrimation, photophobia, and visual loss in the right eye of several months' standing. Because the eye trouble had been intermittent, he had not troubled himself to report earlier to his medical officer. The patient denied ever having had malaria, and, on admission, was afebrile. There was no history of chills or fever and he felt perfectly well except for his right eye, which showed a typical dendritic keratitis. Thick and thin blood smears were studied, but it was only after a nicotinic and adrenalin series of smears that a positive diagnosis of estivo-autumnal malaria could be made. The cornea of the right eye was treated with topical applications of iodine, atropine, and bandaging. The estivo-autumnal malaria apparently responded to atabrin, since daily blood smears continued to be negative for two weeks after treatment. A follow-up nicotinic acid and adrenalin series of smears failed to show any sign of parasites. The eye was well within the first week of treatment. The vision was 20/20 O.U., on discharge.

This apparently represents a case of dendritic keratitis in a chronic estivo-autumnal malaria or malignant tertian. The fact that malaria was denied by the patient is not surprising, since asymptomatic chronic malaria is not uncommon in the tropics.

*Case 3.* A continental soldier, aged 23 years, had been in the tropics for over two years and was admitted to Gorgas Hospital on December 18, 1943. His chief complaints were pain, lacrimation, and swelling of the lids of the right eye inter-

mittently for  $1\frac{1}{2}$  years. His eye symptoms usually lasted two or three days and then subsided spontaneously. These attacks occurred about every two or three weeks but had been increasing in frequency just before admission. There was a history of malaria with treatment in June, 1942. His eye trouble began soon after this attack, but he was not seen by an ophthalmologist until February, 1943, at which time a dendritic keratitis of the right eye was noted. It apparently subsided quickly, for he was not seen again until the present admission in December, 1943. A characteristic area of dendritic keratitis was seen at the 9-o'clock position near the limbus. During the first five days in the Hospital the temperature was normal, and the patient had no complaints aside from the eye. Thick and thin smears disclosed tertian malaria on the third day following an adrenalin series of smears. Only after atabrin therapy was begun did the temperature go as high as  $99^{\circ}\text{F}$ . The cornea of the right eye quickly healed fol-

lowing three topical applications of iodine and the usual supportive treatment of atropine and bandaging. The vision was 20/20 O.U., on discharge. There was no further recurrence of the keratitis.

This case illustrates a recurrent keratitis with afebrile chronic tertian malaria.

#### SUMMARY

1. Dendritic keratitis may be associated with chronic or latent asymptomatic malaria.

2. The diagnosis of malaria may require repeated blood smears or special technique to prove the presence of the plasmodium.

3. Treatment of the malaria when present is of paramount importance for the treatment of the keratitis.

4. The returning forces will bring a considerable amount of chronic malaria with them. Dendritic keratitis may serve as a diagnostic aid when this association is kept in mind.

*Gorgas Hospital.*

#### REFERENCE

- <sup>1</sup> Maxwell, E. M. Quoted by Elliot in "Tropical ophthalmology." London, 1920, p. 452.

# A COMPARATIVE STUDY OF THE BACTERIOLOGIC FLORA OF NASAL AND NASOPHARYNGEAL MEMBRANES OF PATIENTS WITH CERTAIN OCULAR DISORDERS\*

CONRAD BERENS, M.D., AND EDITH L. NILSON CUMMING  
*New York*

For many years we have studied the role of focal infection as an etiologic agent in certain ocular diseases, especially those of the inflammatory type. Our interest has been focused particularly upon the upper respiratory tract because it has long been recognized as a portal of entry through which infection may gain access to and affect other parts of the body, either by secondary infection or by the liberation and transmission of toxins from the primary focus. Therefore, in ocular disorders in which the etiology is obscure or suggestive of focal infection, the nasal and nasopharyngeal membranes are ordinarily investigated in our search for possible foci. Such an investigation includes not only clinical examination by a rhinologist but also bacteriologic studies and roentgen rays, although the latter are of themselves usually inadequate for the determination of pathologic changes in the sinuses.

A recent investigation,<sup>1</sup> dealing with the comparative bacteriology of the nasal and external ocular membranes in certain extraocular diseases, showed a marked bacteriologic similarity of the nasal and ocular flora in 50 percent of the cases studied. The present study was undertaken to determine whether or not there exists a comparable similarity between the nasal and nasopharyngeal flora, or whether cultures from more than one site may be necessary for a complete bacteri-

ologic picture of the upper respiratory tract. The report is based on the findings in 277 sets of cultures taken separately from the nasal and nasopharyngeal membranes of 228 patients in whom upper-respiratory infection was suspected as one of the possible causes of an associated ocular disorder.

## PRELIMINARY OBSERVATIONS

In studying the bacteriology of the upper respiratory tract we were, for some time, under the general impression that any pathogens harbored in this region would be revealed by cultures from the nasopharynx. According to Van Alyea,<sup>2</sup> "the naso-pharynx is a great collecting place for germs of all kinds and from all places . . . they may arrive there from any sinus either side of the nose, from the pharynx (tonsils, adenoids, pharyngeal bursas, etc.) and may be coughed up from the larynx." He further points out that "exudates from all the sinuses accumulate in the naso-pharynx, being carried there by the muco-ciliary stream." Proetz<sup>3</sup> also emphasizes this point, stating that "it has been well established that all such streaming from both the anterior and posterior series of sinuses is backward to the pharynx." With these facts in mind it seemed logical to assume that nasopharyngeal cultures were all that were necessary to obtain a bacteriologic picture of the upper respiratory tract. This assumption was further supported by the theory of direct extension of infection as outlined by MacKenty,<sup>4</sup> who stated that "sinusitis is never strictly confined to a single sinus. At least, to some degree, all the sinuses on

\* From the Department of Research in Ophthalmology, Columbia University and New York Eye and Ear Infirmary. Research aided by a grant from the Snyder Ophthalmic Foundation. Preparation of manuscript aided by a grant from the Ophthalmological Foundation, Inc.



the same side are affected." Moreover, he believed that sinusitis was seldom limited even to one side, for the infection soon spreads from the original focus to all the sinuses. On this basis one would naturally expect that the same pathogen or pathogens would be the causative factor in all the sinuses involved, and that, since most of the sinuses would be more or less infected, at least some of these pathogens would reach the nasopharynx.

However, certain discrepancies in these theories eventually became apparent. During a previously mentioned study,<sup>1</sup> dealing with the comparative bacteriology of nasal and ocular membranes, cultures from the nasopharynx were often included for reasons not associated with the research project. It was noted that in a number of instances the nasal cultures revealed the presence of pathogens not found in the nasopharyngeal cultures. This was particularly so in the case of toxigenic staphylococci, which were often found in the nasal cultures only. Other investigators made similar observations, among them Jacobson and Dick,<sup>5</sup> who concluded that examination of the *nasal* bacteria was the easiest method of determining the causative agent of infections of the ear and *upper respiratory tract*. These findings led to further considerations. For some time we had been puzzled by marked differences in the results obtained from autovaccine therapy. Some patients responded remarkably well to vaccines prepared from their nasopharyngeal pathogens, whereas others showed little or no improvement. Obviously there were a number of possible reasons for these failures, but it occurred to us that one of them might be the employment of an unsuitable vaccine. If the pathogens recovered from the nasopharyngeal culture did not include the etiologic agent of an associated ocular disorder, it followed that desensitization to these organisms

would not bring about the desired results. With this in mind, several patients who had failed to respond to nasopharyngeal vaccines, and whose nasal cultures revealed pathogens of a different type, were given vaccines prepared from the latter. In some instances a gratifying improvement was noted after instituting therapy with the nasal vaccine, in marked contrast to the poor response elicited by the nasopharyngeal vaccine.

These observations and results were difficult to reconcile with the opinions generally held as well as with our own former impressions. In seeking an explanation we speculated as to the possibility (1) of an interruption in the normal mucociliary flow due to the effect of toxins or other factors on the sinus membranes. Schillinger,<sup>6</sup> in discussing this subject, mentions the important role which infections, especially of the chronic type, may play in the injury or destruction of ciliary action. He states that "when a (sinus) membrane is diseased, it slows up in its work or stops functioning, and symptoms develop." Thus there is the possibility of a sinus being walled off by an area of nonvital membrane in which the cilia are either nonactive or missing. It would seem that such a condition would surely retard or prevent the normal flow, and that under such circumstances the discharge from infected anterior sinuses might readily fail to reach the nasopharynx at all. (2) Another factor to be considered is the existence of anatomic anomalies, such as a deflected septum or multiple polypi, which might act as mechanical barriers to the normal mucociliary current. Here again one might conceivably fail to isolate the causative agent of an anterior sinusitis from a nasopharyngeal culture.

A survey was made to ascertain whether or not a single set of nasal and nasopharyngeal cultures could be relied

upon to reveal the organisms ordinarily harbored by the individual in these areas. It was found that, in most instances, repeated cultures gave substantially the same results as the original ones. In a number of cases the bacteriologic picture of the nose and throat has remained the same over a period of years. For example, in one case, five sets of cultures taken over a period of five years, consistently revealed many coliform bacteria in both sides of the nose whereas nasopharyngeal cultures showed no coliform bacteria except in one instance when there were only a few present. Similarly, in another case, in which eight sets of cultures were taken over a period of five years, at no time did the nasal cultures reveal coliform bacteria, although they were present in every instance in the nasopharyngeal cultures. Naturally, in those instances in which local treatment or vaccine therapy was successfully employed, symptomatic improvement was frequently associated with a decrease in number, attenuation of toxigenicity, or even complete elimination of the pathogens originally found. Two typical cases will serve to illustrate such a process. (1) Mr. E. L., in 1937, showed toxigenic staphylococci, toxigenic streptococci, and *E. coli* in his nasopharyngeal culture and toxigenic staphylococci in his nasal culture. He was placed on minute doses of autogenous vaccine and responded remarkably well, in so far as his clinical symptoms were concerned. In 1939, his nasopharyngeal culture showed no coli, but the toxigenic staphylococci and streptococci were still present, as were the toxigenic staphylococci in his nose. He continued on vaccine therapy until 1941, when nasal cultures showed only nontoxigenic staphylococci and nasopharyngeal cultures showed only nontoxigenic streptococci and staphylococci. (2) Mr. F. B. G., in 1936, showed *B. friedländer* in his nasopharynx, the only

significant finding. This organism produced a +++-iritis and very toxic symptoms when injected intravenously (0.3 c.c. of an 18-hour culture) into rabbits. Two months later the cultural findings were the same, as was the effect on rabbits. In 1937, the *B. friedländer* was still present but was not so toxic for rabbits as it had been, and in 1939, its effect on rabbits was practically nil. Some months later the organism resembled a typical *E. coli* rather than a *B. friedländer*, and again it was relatively nontoxic for rabbits. In 1940, there were no coliform bacteria present, and from then until 1942, when he was last seen, cultures were repeated at intervals of three to six months but showed no coliform bacteria at any time. These cases serve to demonstrate the uniformity of cultural findings as well as the possibility of eliminating pathogens by immuno-therapy. Fortunately the process is not always so slow as in the cases just cited, and usually clinical improvement is noted in such cases long before the pathogen is finally eliminated.

Examination of hundreds of bacteriologic records of patients on whom a number of repeated cultures had been taken at various intervals confirmed our impression that a single set of nasal and nasopharyngeal cultures gave results which were sufficiently accurate to make the findings a reliable index of the individual's ordinary nasal and nasopharyngeal flora and that such findings are not usually a matter of chance, subject to circumstances existing at the time of culture.

#### OUTLINE OF PROCEDURE

Nasal cultures were obtained by inserting dry sterile swabs in front of the middle turbinates and then along the lower turbinate and septum as far posteriorly as possible without first shrinking the nasal membranes. Postnasal cultures were obtained by similarly swabbing the naso-

pharyngeal region and also obtaining a portion of such postnasal discharge as might be present. Previous experiments (unpublished data) had shown this to be the preferable method of obtaining cultures because more pathogens were usually recovered in this way than by the use of a West swab or by nasal lavage. It is possible that the dry swab picks up organisms firmly imbedded in the mucous membrane which would otherwise not be dislodged; we have found that the use of swabs moistened with broth for easier passage are not nearly so satisfactory for the recovery of pathogens.

The present report represents data compiled from these bacteriologic studies of 228 patients in whom chronic upper-respiratory disease was one of the suspected causes of an associated ocular disorder. A total of 277 bacteriologic studies was made, specimens from a number of these patients having been cultured on one or more occasions.

Of the various organisms recovered, the principal pathogens were toxigenic staphylococci, streptococci, and members of the coliform group. Pneumococci were included in the streptococcal group, as suggested by Topley and Wilson,<sup>7</sup> and, since we were primarily interested in determining the pathogenicity of the individual strains, type identification was usually omitted. The hemolytic streptococci found in this series were not classified, but since none of the patients from whom they were isolated showed clinical symptoms of acute streptococcal infection, such as is usually associated with the Lancefield group A streptococcus, such classification was not considered essential. However, in view of the existence of possible carriers, it is planned that future studies will include serologic tests for classification of such hemolytic streptococci as may be isolated. *Neisseria catar-*

*rhialis*, diphtheroids, *Bacillus subtilis*, and *Haemophilis influenzae* were also seen, but because these organisms have not been established as etiologic agents in chronic disease, the discussion is limited to those previously mentioned.

#### METHODS OF INDICATING PROBABLE PATHOGENICITY

*Staphylococci.* *In vitro* tests used to indicate pathogenicity of staphylococci have been discussed elsewhere.<sup>8-16</sup> The tests used for this study were confined to determination of chromogenesis, hemolysin production, mannitol fermentation, and coagulation of citrated rabbit-blood plasma. Coagulase-positive strains were considered pathogenic regardless of their reaction to the other *in vitro* tests because the coagulase test is now recognized as a reliable substitute for animal inoculation tests.

*Streptococci.* Hare,<sup>17</sup> Heist,<sup>18</sup> Todd,<sup>19</sup> Solis-Cohen,<sup>20</sup> and others have shown that resistance of beta hemolytic streptococci to the bactericidal power of fresh blood is parallel with certain pathogenic properties. Chapman<sup>21, 22</sup> and his co-workers have shown that the ability of both hemolytic and nonhemolytic types of streptococci (not including enterococci) to resist the bactericidal power of fresh blood corresponds to a high degree with their toxicity for laboratory animals. *In vitro* tests, based on this principle, have been proposed by Chapman as reliable indicators of probable pathogenicity, and were used in the present study. Over the period of years in which we have employed these tests, we have found them to be of great value in confirming the suspicion of disease, the presence of resistant streptococci often being associated with suggestive clinical symptoms. An exception is made in certain instances in which the mere presence of streptococci,

regardless of their *in vitro* reaction, is suggestive of disease. This appears to be the result of lowered resistance of the membranes rather than of the toxicity or virulence of the organism. One example is the presence of any type of streptococcus in the nares, a finding which our observations have led us to consider pathologically significant. In this regard the observations of Jacobson and Dick<sup>5</sup> conform with ours.

*Coliform bacteria.* The significance of coliform bacteria in the human upper respiratory tract has been reported,<sup>23, 24</sup> and the contrast in pathogenicity between these and human fecal strains has been shown. Our experiments indicate that these upper-respiratory coliform strains, most of which are highly toxic for rabbits, both ocularly and systemically, are also pathogenic for those patients from whom they were isolated. Clinical symptoms in these patients appear on the whole to be more severe than are those in patients with chronic upper-respiratory infection caused by other organisms.

#### BACTERIOLOGIC FINDINGS IN 277 SETS OF NASAL AND NASOPHARYNGEAL CULTURES

Tables 1, 2, and 3 show the incidence of staphylococci, streptococci, and coliform bacteria, respectively, in the 277 sets of nasal and nasopharyngeal cultures.

*Staphylococci.* Toxic staphylococci were found in the nasal or nasopharyngeal membranes in 186 of the 277 sets of cultures (table 1). Although toxic staphylococci were present in both nasal and nasopharyngeal cultures in 79 instances (28.5 percent), in 79 other instances (28.5 percent) they were present in the nasal membranes only, whereas in 28 (10.1 percent) sets of the cultures they were present in the nasopharynx only. This illustrates the importance of taking both

TABLE 1  
INCIDENCE OF TOXIGENIC STAPHYLOCOCCI IN 277 SETS OF NASAL AND NASOPHARYNGEAL CULTURES

Nasal Culture	Nasopharyngeal Culture	No.	Percentage
+	+	79	28.5
+	0	79	28.5
0	+	28	10.1
0	0	91	32.9
Total		277	100

+ Toxigenic Staphylococci; 0 Nontoxigenic or no Staphylococci.

nasal and nasopharyngeal cultures.

*Streptococci.* For determining the presence of toxigenic streptococci in the upper respiratory tract, the nasopharynx is apparently the site of choice from which to obtain culture material. Only very

TABLE 2  
INCIDENCE OF STREPTOCOCCI IN 277 SETS OF NASAL AND NASOPHARYNGEAL CULTURES

Nasal Culture	Nasopharyngeal Culture	No.	Percentage
-	+	198	71.5
+	+	25	9.0
0*	+	10	3.6
0*	0	7	2.5
+	0	1	.4
-	0	20	7.2
-	-	16	5.8
Total		277	100

+ Toxigenic Streptococci; 0 Non-toxigenic Streptococci; - No Streptococci.

\* The presence of streptococci in the nasal membranes is considered a pathologic finding regardless of the toxigenicity of the organism.

TABLE 3  
INCIDENCE OF COLIFORM BACTERIA IN 277 SETS OF NASAL AND NASOPHARYNGEAL CULTURES

Nasal Culture	Nasopharyngeal Culture	No.	Percentage
+	-	24	8.7
-	+	25	9.0
+	+	16	5.8
-	-	212	76.5
Total		277	100

+ Present; - Absent.

rarely does one recover toxigenic streptococci from the nose without finding similar strains in the corresponding nasopharynx. In the present series there was only one such instance (table 2). In the majority of the cultural studies, toxigenic streptococci were found in the nasopharynx only. In only 25 instances (9 percent) were toxigenic streptococci recovered from both nasal and nasopharyngeal cultures. In 10 other instances (3.6 percent) the recovery of nontoxigenic streptococci from nasal cultures was at

In any case, it seems generally agreed that streptococci *per se* are not present in the normal healthy nasal membrane.

*Coliform bacteria.* Although the total incidence of coliform bacteria in this series of cultures (table 3), as indicated by both nasal and nasopharyngeal cultures, was 23.5 percent (65 instances), the organisms were present in both cultures in only 5.8 percent (16 instances). In 8.7 percent (24 instances) they were present in the nasal membranes only, and in 9.0 percent (25 instances) in the naso-

TABLE 4  
DISTRIBUTION OF PATHOGENS IN 110 SETS OF NASAL AND NASOPHARYNGEAL CULTURES  
IN WHICH ONE OR MORE PATHOGENS WERE SHARED BY THE TWO FOCI

Distribution of pathogens	Example		No.
	Nose	Nasopharynx	
One shared pathogen, additional unrelated pathogen or pathogens in nasopharynx†	Toxigenic Staph. —	Toxigenic Staph. Coliform bacteria Toxigenic Strep.	66
One shared pathogen, additional unrelated pathogen or pathogens in nasal membranes*	Toxigenic Strep. Toxigenic Staph.	Toxigenic Strep. —	6
One shared pathogen, additional unrelated pathogens in both foci*†	Coliform bacteria Toxigenic Staph.	Coliform bacteria Toxigenic Strep.	8
One shared pathogen, no additional pathogens in either focus	Toxigenic Strep.	Toxigenic Strep.	20
Two shared pathogens, no additional pathogens in either focus	Toxigenic Staph. Toxigenic Strep.	Toxigenic Staph. Toxigenic Strep.	8
Two shared pathogens, additional pathogen in nasopharynx†	Escherichia coli Toxigenic Staph. —	Escherichia coli Toxigenic Staph. Toxigenic Strep.	2
Total			110

\* Instances in which nasopharyngeal cultures alone did not reveal all the pathogens present in the upper respiratory tract.

† Instances in which nasal cultures alone did not reveal all the pathogens present in the upper respiratory tract.

least suggestive of pathologic alteration, since the presence of nasal streptococci *per se* is considered abnormal. If we are correct in assuming that any streptococcal infection of the nasal membranes had its inception in the nasopharyngeal region, it would follow that the presence of streptococci in the nose is indicative of a more extensive involvement than is the case when they are recovered from the nasopharynx alone. Such a finding may be an indication as to the extent of infection.

pharynx only, again demonstrating the importance of culturing specimens from both sites.

#### INCIDENCE OF PATHOGENS

Analyzing the bacteriologic findings in regard to the presence of probable pathogens, irrespective of the type of organism involved, we note the following results (table 4): (1) In 110 sets of cultures (39.7 percent), the nasal cultures showed one or more pathogens and the corres-

TABLE 5  
COMPARATIVE BACTERIOLOGY OF 277 SETS OF NASAL AND NASOPHARYNGEAL CULTURES

	No.	Percent- age
Pathogens in nasal membranes unrelated to pathogens in nasopharynx*†	71	25.6
Pathogens in nasopharynx, none in nasal membranes†	77	27.8
Similar pathogens (one or more) in nasal and nasopharyngeal membranes (see table 4)	110	39.7
Pathogens in nasal membranes, none in nasopharynx*	12	4.4
No pathogens in either nasal or nasopharyngeal membranes	7	2.5
Total	277	100

\* Instances in which nasopharyngeal cultures alone did not reveal all the pathogens present in the upper respiratory tract.

† Instances in which nasal cultures alone did not reveal all the pathogens present in the upper respiratory tract.

ponding nasopharyngeal cultures showed one or more of the same pathogens. In 82 of these 110 sets of cultures there were other pathogens, either in the nose or nasopharynx or both, in addition to those shared by both foci. (2) Of the 277 sets (table 5) of cultures, 71 (25.6 percent) showed nasal pathogens of a genus different from those found in the nasopharynx. (3) In 77 sets of cultures (27.8 percent), one or more pathogens were present in the nasopharynx, but the corresponding nasal cultures yielded no pathogens. Included in this number, however, were seven nasal cultures in which the presence of nontoxigenic streptococci should probably be considered a pathologic finding. (4) There were 12 instances (4.4 percent) in which nasal cultures showed the presence of pathogens whereas the corresponding nasopharyn-

geal cultures showed none. (5) No pathogens were found in either nasal or nasopharyngeal cultures in seven instances (2.5 percent).

A summary of these results (table 6) shows that nasopharyngeal cultures alone would have failed to reveal the presence of other pathogens in the upper respiratory tract in 97 instances (35 percent), whereas nasal cultures alone would have failed to do so in 224 instances (80.9 percent). In 242 instances (87.4 percent), cultures from both nasal and nasopharyngeal membranes yielded more pathogens than would have been obtained from only one of these sites. The bacteriologic picture was similar in both cultures in only 35 instances (12.6 percent).

#### ADDENDA

These results demonstrate the necessity

TABLE 6  
COMPARATIVE INCIDENCE OF PATHOGENS (IRRESPECTIVE OF TYPE) IN 277 SETS OF NASAL AND NASOPHARYNGEAL CULTURES

	No.	Percent- age
Instances in which nasal cultures revealed pathogens not found in nasopharyngeal cultures	97	35.0
Instances in which nasopharyngeal cultures revealed pathogens not revealed by nasal cultures	224	80.9
Instances in which cultures from both nasal and nasopharyngeal membranes revealed more pathogens than would have been revealed by either alone	242	87.4
Instances in which both nasal and nasopharyngeal cultures yielded identical bacteriologic findings	35	12.6

for culturing more than one locus when searching for pathogens in the upper respiratory tract. They also suggest the advisability of culturing each suspicious focus separately and directly, and not relying on drainage areas to reveal the etiologic organisms. As the first step in this direction, we proceeded to take separate cultures from each side of the nose, which led to the observation that there may frequently be a marked difference between the bacteriologic flora of the right and left nasal membranes. In a number of cases the pathogens on one side were totally unrelated to those found on the opposite side. In many instances one side yielded only nonpathogens whereas the other side yielded one or more highly toxigenic organisms. Usually, in these cases, the clinical nasal symptoms were more marked or were even limited to the side from which the pathogens were isolated. The study of the bacteriologic content of the nasal cavities, undertaken primarily to establish the possible relationship to associated ocular involvement, revealed in many instances a unilateral ocular involvement on the same side as a unilateral nasal infection.

We have recently instigated the practice of having cultures taken directly from any suspicious nasal accessory sinus whenever possible. Such cultures are, of course, taken by a rhinologist. In several instances sinus cultures have yielded pure growths of pathogenic organisms of an entirely different type from those found in either nasal or nasopharyngeal culture of the same patient.

#### SUMMARY

Because focal infection appears to be an etiologic factor in many ocular disorders, improved methods of recognizing these possible foci have been sought. We have been particularly interested in the upper respiratory tract because of its role

as a portal of entry for infection of both a primary and secondary nature. Its proximity to the ocular structures enhances the importance of this tract as a source of infection and our investigations include clinical and roentgen-ray examination as well as bacteriologic studies.

Concerning the latter, some investigators have assumed that nasal cultures alone were sufficient to reveal any pathogens present in the upper respiratory tract, whereas others were under the impression that nasopharyngeal cultures were more satisfactory for this purpose. However, clinical and bacteriologic observations led us to believe that both nasopharyngeal cultures and nasal cultures might be necessary for a complete bacteriologic picture. Although a previous investigation showed a marked bacteriologic similarity between the external ocular membranes and corresponding nasal membranes in 50 percent of the patients studied, there was no proof of the existence of a comparable bacteriologic similarity between nasal and nasopharyngeal membranes. Consequently, a comparative study of the bacteriologic flora of the nose and nasopharynx was indicated.

Two hundred seventy-seven cultural studies were made of the nasal and corresponding nasopharyngeal membranes of 228 patients. The most common pathogens found were toxigenic streptococci (including pneumococci), toxigenic staphylococci, and members of the coliform group. *In vitro* tests were used to determine the pathogenicity of streptococci and staphylococci. Previous studies had pointed out the pathologic significance of the presence of coliform bacteria in the upper respiratory tract and of streptococci (regardless of toxigenicity) in the nasal membranes.

Toxigenic staphylococci were present in the nasal cultures alone in 79 instances, in the nasopharyngeal cultures alone in

28 instances, and in both nasal and nasopharyngeal cultures in 79 instances.

Toxigenic streptococci were present in the nasopharynx alone in 198 instances, in the nose alone in one instance, and in both nasopharynx and nose in 25 instances. However, there were 17 instances in which there were nontoxigenic streptococci in the nasal cultures (a probable pathologic finding), of which the corresponding nasopharyngeal cultures showed toxigenic streptococci in 10 instances and nontoxigenic streptococci in seven instances.

Coliform bacteria were present in the nasal culture alone in 24 instances, in the nasopharyngeal culture alone in 25 instances, and in both cultures in 16 instances.

Comparison of the incidence of pathogens, irrespective of type, showed the following results: There were 71 instances in which the pathogens found in the nose were of an entirely different type from those found in the corresponding nasopharynx; in 77 instances only the nasopharyngeal culture yielded pathogens, whereas in 12 instances only the nasal culture yielded pathogens; there were 110 instances in which the nasal cultures showed one or more pathogens whereas the corresponding nasopharyngeal culture showed one or more of the same pathogens. However, 82 of these had other pathogens, either in the nose or nasopharynx or both, in addition to those already shared by both foci. In seven in-

stances, there were no pathogens in either nose or nasopharynx.

Thus, nasopharyngeal cultures alone would have failed to reveal the presence of pathogens or additional pathogens in the upper respiratory tract in 97 instances, whereas nasal cultures alone would have failed to do so in 224 instances. In 242 of the 277 sets of cultures, more pathogens were recovered by employing both nasal and nasopharyngeal cultures than would have been obtained by culturing one site or the other. In only 35 instances was the bacteriologic picture identical in both cultures.

### CONCLUSIONS

The bacteriologic studies described show that, in most instances, cultures from both nasal and nasopharyngeal membranes are a far more reliable index of the presence of possible etiologic pathogens than are cultures from either site alone. Preliminary investigation suggests the necessity of culturing more than these two sites in order to obtain a satisfactory bacteriologic picture of the upper respiratory tract.

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# ALLERGIC RETINOSIS\*

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Several cases of allergic reactions of the retina have been reported in the literature, but the association of allergy as the etiologic factor is indefinite in many. After a consideration of pertinent facts, a case of retinal allergy in which the etiologic factor is not indefinite will be presented.

Certain tissues respond to allergins with greater frequency and intensity than do others. Bedell<sup>1</sup> states that these "shock" tissues are the skin, conjunctiva, and retina. Since the bacterial infection may produce definite hypersensitivity of the ocular tissues, and since it is possible that many ocular inflammations may be allergic reactions, we should carefully consider instances of definite clinical allergy in the retina.

## SUMMARY OF EXPERIMENTAL EVIDENCE

It has been amply demonstrated by experimental methods that the eye is capable of allergic response. Nicolle and Abt<sup>2</sup> first revealed the possibility of allergic reactions within the eye by sensitizing animals to serum by intraperitoneal injection. Subsequent intraocular injection of the serum produced a violent local inflammation.

Sattler<sup>3</sup> found that only a slight reaction followed a preliminary injection into the eye, whereas reinjection at a later date produced a peculiarly violent response.

Other work by Krusius, Kummel, Dold and Rados, Szily, Fuchs, and Miller proved that the tissues of the eye can be readily sensitized either locally or as part of a general sensitization, and that these

tissues are capable of violent allergic responses.

Seegal and Seegal<sup>4</sup> showed that occasionally the sensitized eyes of rabbits could be made to flare up by the introduction of the antigen by the gastrointestinal route, and that desensitization could be achieved by repeated intravenous injections of the antigen.

The retina itself has antigenic properties and produces lytic and agglutinating antibodies.<sup>5</sup> Woods<sup>6</sup> sensitized dogs by intraperitoneal injection and then perfused the eye with the antigen. Numerous small hemorrhages developed in the retina. It was apparent that the blood diffused out of the vessels, that actual breaks in the vessels did not occur.

## SUMMARY OF CLINICAL REPORTS

The association of allergy and the retinal reaction is too often obscure in many of the reported cases of allergic reactions in the retina. This difficulty seems to have occurred in part because the allergen was not known, in part because the patient would not submit to a critical test, or because all methods of demonstrating the association were not used, in part because the association with allergy was only a clinical suspicion, and because the opportunity for pathologic study does not occur.

The types of visible retinal responses to allergy are:

1. *Intense edema.* Bedell<sup>1</sup> noted retinal edema following injection of serum in a sensitive patient and observed that it was associated with a widespread urticarial reaction. Lemoine<sup>7</sup> states that he has frequently observed diffuse edema of the retina extending three or four disc-

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diameters around the optic nerve head and involving the macula. He first considered these cases to be allergic but later noted the condition in patients in whom it was not possible to demonstrate an allergy. No case reports were included in this report. Plumer<sup>8</sup> presented a case of recurrent edema of the macula in an allergic patient who had eaten peanuts before each attack. Unfortunately, the patient would not consent to eating peanuts as a direct test. Horniker<sup>9</sup> reported 10 cases of macular edema with sudden onset. In a majority of these cases there was evidence of arterial spasticity, the occurrence of migraine-like phenomena, and a family history of vascular disease. Although Horniker was unable to reach a definite conclusion in respect to etiology, he did not believe that allergy was the cause. Duggan<sup>10</sup> reported six similar cases, believed the edema to be in the choroid, and found that they responded to vasodilators, as did Horniker.

2. *Retinal hemorrhages.* Retinal hemorrhages are the effect of increased permeability of the capillaries, and many superficial and deep hemorrhages may occur. The picture may even simulate occlusion of the central retinal vein.<sup>11</sup> However, allergic retinal hemorrhages characteristically vary rapidly in location and appearance. Bedell<sup>12</sup> reported two cases of retinal hemorrhages with fundus photographs. These were presumed to be due to allergy, but in at least one of these the evidence seemed inconclusive, as is so frequently the case with reports on retinal allergies.

3. *Retinal detachment.* Several cases of retinal detachment, presumably allergic, have been reported. Prewitt<sup>13</sup> presented a case of recurrent bilateral retinal detachments which came on concurrently with nodular swellings of the body. Balyeat<sup>14</sup> demonstrated a case of complete bilateral retinal detachment in an allergic

patient 21 years of age. There was no evidence to support any other than a coincidental relationship between the retinal detachments and the allergy. Wiener<sup>15</sup> refers to a case of flat retinal detachment in a patient with chronic skin disease and sensitivity to trichophytosis in whom the loss of vision and advent of the skin disease were associated. Wiener states that there was a focal reaction in the retina in addition to the local reaction in the skin. Unfortunately, no details were reported.

4. *Recurrent neuroretinitis.* Ruedemann<sup>16</sup> cited such a case associated with pollen sensitivity. The question of brain tumor had been raised but the recurrences were found during the hay-fever season.

#### ANATOMIC CONSIDERATIONS

In the case to be presented, the edema was visible only in the vicinity of the macula, as is shown in the accompanying illustration. This has been true of many of the other reports on allergic reactions as well as retinal edema from other causes. The ability of the macula to absorb fluid is due, in part, to the striking thickness of the internuclear layer of the retina in this region. It is also significant that the choroidal capillary network is especially well marked in this region and the lumen of these vessels is wider than elsewhere. The more peripheral parts of the retina may preserve their transparency even in circumstances which we know to be associated with a very high degree of edema; for example, in cases with occlusion of the central retinal vein.<sup>17</sup>

#### DISCUSSION OF THE REPORTED CASE

The case to be presented is of interest because allergy was more definitely the etiologic factor than in most of the other reported cases of retinal allergy.

In brief, the patient was a highly allergic individual who had had hay fever,

allergic rhinitis, and asthma during most of his life and allergic keratoconjunctivitis during the past two years. He was sensitive to numerous allergens and had a definite family history of allergy. His general physical condition was otherwise excellent. Edema of the macular region of one eye occurred with sudden onset and reduced the visual acuity from 20/50 to a dubious 20/200. The reduction in the visual acuity to 20/50 was due to keratitis. One-half hour after the administration of 1 c.c. of epinephrin hydrochloride the visual acuity again increased to 20/50. During the following hours the acuity again diminished but responded to the administration of epinephrin in oil over a period of several days, and the edema of the macula subsided.

Two days before the onset of the macular edema, X-ray therapy had been administered to the cornea of each eye, with the contact machine. This, however, must be regarded as purely coincidental, since the type of radiation given does not penetrate to the retina in sufficient quantities to be of any significance; the effect of this X-ray therapy does not become manifest for approximately two weeks; and the therapy was administered to both eyes whereas the macular edema occurred in only one.

The association of the macular edema and the allergy is as definite as most cases of this type can be. The individual was highly allergic and developed edema of the macula during a period of exacerbation of allergic manifestations in the conjunctiva, cornea, skin, and nose. The visual acuity responded dramatically to epinephrin therapy and the edema subsided more slowly with continued administration of epinephrin. It was, unfortunately, impossible to determine the specific allergen at fault, since the patient was highly sensitive to so many allergens. This precluded the possibility of the criti-

cal test—that of administering the allergen to determine whether or not a flare-up of the edema of the retina could be produced.

It is to be noted that Duggan's cases of choroidosis centralis serosa and Horniker's cases were presumably on a vascular basis and responded to vasodilators. The case presented is that of an allergic individual without demonstrable vascular abnormalities who responded dramatically to a vasoconstrictor.

#### CASE REPORT

E. C., a white man, aged 42 years, entered September 12, 1944, complaining of having had inflamed eyes for two years—more severe recently.

Since the age of 15 years, the patient had had mild attacks of hay fever, rhinitis, and occasional asthma. These occurred only on the sea coast, but were without seasonal incidence.

The patient was examined by an allergist six months before entry and given numerous skin tests. He was found to be sensitive to 10 ingestants, 5 environments, 22 pollens, and dust from his house, pillows, and mattress. The process of desensitization was instituted with a mixture of pollens and dust. These were administered over a period of two months and some improvement in the ocular inflammation is said to have occurred. During the three weeks before entry the condition recurred. The patient had worked hard during the past year and had been generally fatigued.

The patient's mother and daughter both had asthma. The former was sensitive to pollens, the latter became asthmatic in association with colds.

During the past two years the patient's left eye had itched, burned, watered, and become red intermittently—more markedly so in the past three weeks. The same process had been present in the right eye

for the past five months. The patient had been examined by several ophthalmologists, and various preparations containing epinephrin and related compounds had been used, with temporary alleviation of symptoms. No precipitating cause of either the ocular or respiratory symptoms had been discovered. During these past two years the patient had spent almost one half of his time on the eastern seaboard and the remainder on the western seaboard without experiencing any appreciable difference in the process.

*Eye examination.* Vision: Each eye 20/50+ uncorrected; 20/25 corrected.

External examination of each eye disclosed that the skin of the lids was red and somewhat thickened. The palpebral and orbital conjunctivas were moderately red and several flecks of mucus floated about the fornices. Circumcorneal injection was present, and a slightly elevated nodular ridge extended around each limbus.

With the use of corneal microscope and slitlamp numerous tiny punctate staining areas on the surface of the cornea were noted after instillation of fluorescein. The corneal epithelium was cloudy, and a fine diffuse opacification was noted at the level of Bowman's membrane, more marked in the left eye.

The media were otherwise clear. Fundus examination was negative. The ocular rotations and tension were within normal limits. The nasolacrimal ducts were patent.

The following refractive error was noted: R.E.  $-0.50D.$  sph.  $\approx -1.50D.$  cyl. ax.  $30^\circ$ ; L.E.  $-0.25D.$  sph.  $\approx -1.00D.$  cyl. ax.  $105^\circ$ .

The visual fields and blind spots were normal as tested with a 2-mm. white test object at one meter.

*Culture.* A few colonies of *Staphylococcus aureus*, coagulase positive, were grown from each eye.

*Smears.* That from the right eye re-

vealed a few epithelial cells but no leukocytes. The smear from the left eye contained some polymorphonuclear neutrophils and rare eosinophils.

*Systemic examination.* No abnormalities were noted except for an allergic rhinitis with a number of nasal polyps and a deviated septum.

*Laboratory tests.* Urine: negative.

Blood: sedimentation rate, 8 mm. hr.; leukocyte count, 6,100 per cu. mm. PME, 1 percent; blood smear, normal; hematocrit, 56; hemoglobin, 18.7 gm. per 100 c.c.; Wassermann, negative.

Stool: negative for occult blood and parasites and parasitic ova.

X-ray examination: Studies of sinuses, chest, and gastrointestinal tract were all negative.

Intracutaneous tests with numerous antigens elicited slight to moderate sensitivity.

*Course.* Patch tests with the various drugs that were to be used in ocular therapy were applied. The conjunctivas were treated with silver nitrate, and penicillin drops were prescribed. During this period of observation and treatment the edema and opacification of the cornea became progressively more marked and the vision had deteriorated to 20/100.

X-ray therapy, 500r. was administered to each cornea with a contact machine on September 30th. The details of this irradiation were HVL-3 mm. A1, ASD 5 cm., area 1.2 cm.

On October 2d, the patient complained that vision in the right eye had become definitely more blurred. Tests of the visual acuity showed it to be slightly less than 20/200 in the right eye, and no improvement could be obtained with any lens. The visual acuity in the left eye was 20/100.

The cornea of the right eye was temporarily cleared with glycerin drops. On ophthalmoscopic examination an area which appeared to be edematous was

noted temporally and below the optic disc. This area was white, slightly elevated, and the retinal vessels passed over it. The apparent edema was most marked below the fovea. The remainder of the fundus

The visual acuity was rechecked and again found to be a dubious 20/200 in the right eye. One c.c. of 1:1,000 epinephrin hydrochloride was administered intramuscularly. In approximately one-

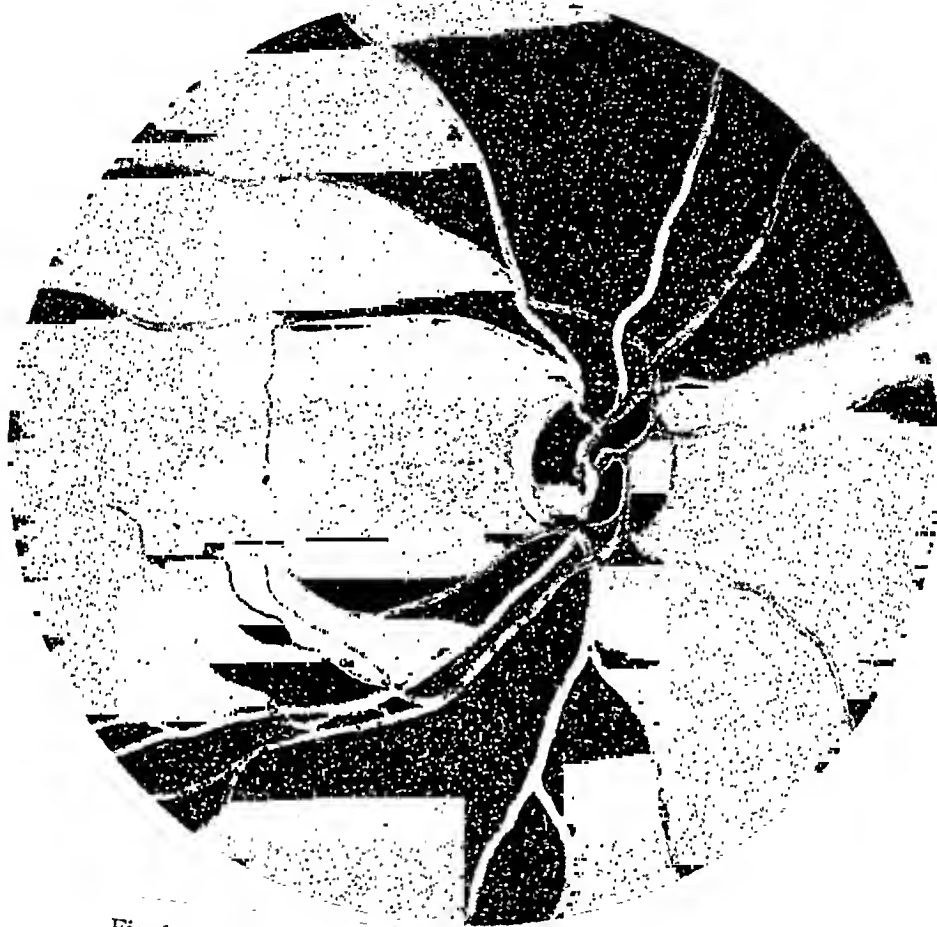


Fig. 1 (Bettman). Fundus in a case of allergic retinosis.

was normal and the entire fundus of the left eye was normal (see figure).

A test of the visual fields disclosed a relative depression superior to the fixation point in the right eye and a very slight depression of the superior temporal quadrant in the left eye. The peripheral visual fields were normal to a 5-mm. white object at one meter. No lesion corresponding to the field defect in the left eye could be seen ophthalmoscopically, but the haziness of the cornea prevented a satisfactory examination.

half hour the visual acuity had improved to 20/50— in the same eye. On ophthalmoscopic examination it was believed that the area of edema was slightly lessened, but the change was not marked. Ophthalmoscopy was performed with some difficulty because of the cloudiness of the cornea.

The patient was placed on a low salt diet and daily injections of ice of epinephrin 1:1,000 in oil were administered. After one day of this treatment the visual acuity was 20/200+1 corrected. After

two days the visual acuity had improved to 20/50 uncorrected and 20/40+ corrected. Fundus examination showed the edematous area to have cleared almost completely. Moderate clearing of each cornea had occurred. Tests of the visual field disclosed that the relative depression was less dense and somewhat smaller. Four days after the adrenalin therapy and low salt diet had been instituted, they were discontinued. The visual acuity remained 20/40+ and no edema was noted on subsequent ophthalmoscopic examinations.

The patient was seen again six weeks later, after returning from a trip east. The cornea of each eye had cleared sufficiently to permit the patient to see 20/15 with each eye with glasses. Ophthalmoscopic examination was completely negative. The visual fields were normal.

allergic reactions in the retina have appeared in the literature the etiologic significance of the allergy has often been questionable. These cases fall into three general categories—edema, hemorrhages, and retinal detachments. Experimentally, it has been demonstrated that allergic reactions can be produced in the retina. Anatomically, one would expect the edema to occur in the region of the macula.

A case is presented of a highly allergic individual in excellent general health, who developed edema of the macula during an exacerbation of allergic reactions elsewhere. The visual acuity definitely increased within a half hour after the administration of epinephrin. The acuity again diminished and again responded to epinephrin. The edema of the macula subsided after several days of epinephrin therapy.

SUMMARY. Although several reports of

2351 Clay Street (15).

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# STATISTICAL ANALYSIS OF 1,000 CONSECUTIVE NEW EYE PATIENTS

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This is not what you might call a scientific paper, it is an introspection. What does an eye physician's practice consist of? How large is the proportion of the refractions, and of the different ocular diseases, the number of glasses ordered? Just how much good does he do, and in what percentage is he unable to render help? Such and similar questions come to the mind of many of us. The figures will vary in different offices according to the distribution of the professions among the patients, the ratio of age groups, and also according to the surgical inclination of the physicians. However, in our city with its schools, offices, railways, and with its industries, farming, mining, and forestry nearby, the patients are distributed among a fair cross-section of various professions. It is not the purpose of this analysis to find out the ratio of rare pathologic conditions. Tens of thousands of persons have to be examined for that purpose; for example, as was done lately by A. H. Downing<sup>1</sup> in his paper "Ocular defects in sixty thousand selectees."

Eye institutions used to issue yearly reports of their activities, but these do not cover those of the practicing ophthalmologist. In the literature of the last 25 years, I found only two papers dealing with this question. Gradle<sup>2</sup> (1931) subjected his new cases, seen in 1923, to a critical and statistical study. Gross comparisons were made for the following five years, but the percentage of the diseases and refractions varied immaterially. Bishop Harman<sup>3</sup> reported in three articles on "The findings of eye examinations," a collection of data furnished by 47 eye physicians in the first year, and

by 79 in the second year. The patients obtained their ophthalmic treatment through the medium of the National Eye Service, established by the National Ophthalmic Treatment Board. The organization includes 90 percent of the population. In each of these years from 1934 to 1937, about 10,000 patients' findings were listed.

I chose to analyze a relatively small number only, but to do it from several angles. One thousand consecutive new eye patients, who had not been examined in the office previously were subjected to this study. "Old" cases were excluded, just as Gradle did, because the patients usually did not receive a complete examination again, and many came for another ailment than that which brought them the first time. This number is large enough to show a general trend, and the numbers show the result per thousand at the same time.

Two main indices were made. One contained the name, age, sex, the main etiologic diagnosis, whether refracted, with mydriatics, whether the glasses were changed, previously seen by ophthalmologist or optometrist, whether surgery was indicated, performed, consultation advised, and the final result. The age curve shows prevalence of the presbyopic age, and a strong shift toward the female—55.6 percent to 44.4 percent; in Gradle's paper 50.67 percent to 49.33 percent. This is due to the small number of men of military age; for example, in the age group 20-30, there were 41 men, and 92 women.

*Etiologic diagnosis.* In each case only



one, the main diagnosis, was entered into this tabulation. The tabulation is far from being correct, first because of the diseases with unknown etiology, to mention only keratoconus, blepharochalasis, hypersecretion of the meibomian glands, subconjunctival hemorrhage, and hypofunction of the lacrimal gland. The second difficulty is what to do with the tropias and phorias and with glaucoma. In the case of these two latter conditions, a special group was made for tropias and phorias, and another for glaucoma. In a case of concomitant strabismus there usually is a refractive error, but this does not produce it alone. In almost all cases also the fusion is weak. This weakness of fusion might be a congenital anomaly or it can be caused by an infectious disease. Paralytic squint was taken out of this group because, evidently, it is due to a disorder of the nervous system.

#### ETIOLOGICAL DISTRIBUTION OF 1,000 NEW CASES

Refraction .....	428
Inflammation .....	117
Secondary to .....	38
Injury .....	68
Secondary to .....	15
Degeneration .....	118
Tumor .....	9
Toxin .....	7
Heredity .....	15
Endocrine disorder .....	10
Vitamin deficiency .....	1
Allergy .....	19
Functional disorders .....	6
Glaucoma .....	17
Muscles .....	56
Unknown .....	20
No pathologic change .....	50
Unfinished .....	6

In almost 43 percent of the patients a refractive error was the main trouble. Inflammatory and degenerative conditions with almost 12 percent each were the next two largest groups. The exposed site of the conjunctiva, cornea, and lids was responsible for this high incidence. The explanation for the equally high per-

centage of degenerative conditions is found in the listing of such diverse conditions as, for example, senile cataract, macular degeneration, pterygium, infarct and concretions, senile vitreous opacities, and detachment of the retina in this group. The fact that 50 patients were found to have no pathologic process proved either the anxiety of parents, of neurotic persons, and of patients taking no chances with their health, or the lack of thoroughness of the examiner. The incidence of glaucoma (1.7 percent) is the number usually found in much larger series. Endocrine disorders were made responsible in 1 percent of cases. This includes the cases of exophthalmic goiter and hypofunction of the lacrimal glands. It is debatable whether this latter condition can be listed here, but there are several points to prove that the disturbed function of the sex glands is a factor in the etiology. Possibly several of the thousand patients have suffered from a slight degree of vitamin deficiency, but only in the case of keratomalacia was this directly responsible.

#### THE MOST COMMON MAIN DIAGNOSES

Presbyopia .....	143
Hyperopic astigmatism .....	80
Myopia and astigmatism .....	66
Cataract .....	62
Inflammatory diseases of the conjunctiva ..	54
No pathologic process .....	50
Myopia .....	35
Myopic astigmatism .....	30
Esotropia .....	30
Inflammatory diseases of the lid .....	29
Chalazion .....	26
Mixed astigmatism .....	26

These 12 groups included almost two thirds of all cases.

*Refractions.* The number of refracted patients was 682. Gradle refracted 69.2 percent. Out of our refracted patients, 285 (41.8 percent) were refracted under cycloplegia; 60.7 percent in Gradle's

series. The ratio of refractions with and without cycloplegia will widely differ in different offices. The fairly low percentage of refractions under cycloplegia is partly due to the fact that I very seldom use mydriatics for retinoscopy in persons over 50 years of age. Quite a number (371) of patients were asked whether their glasses were ordered by a physician or by an optometrist. The results were as follows:

Had glasses from an M.D.: 165—Received new glasses: 111—67.3 percent.

Had glasses from optometrist: 181—Received new glasses: 140—77.3 percent.

Had glasses, don't know where: 25—Received new glasses: 21—84.0 percent.

Glasses ordered by ophthalmologists had been worn for an average of 3.75 years, when they were changed. The glasses of eight patients had been ordered less than a year ago. Glasses ordered by optometrists had been worn for an average of 3.38 years, when they were changed. The glasses of 20 patients had been ordered less than a year ago. Of the 403 patients for whom new glasses were ordered, 180 were refracted objectively and 223 subjectively.

*Major surgery* was performed on 40 eyes (for example, cataract 20, squint 6, ablatio retinae 5, and the like); minor surgery on 54 eyes (foreign body of the cornea 24, chalazion 10, pterygium 8, cauterization of cornea 4, and the like). Surgery was advised in 35 cases but the patients have not returned. The number of hospitalized patients was 42. The number of blind patients with vision less than sufficient for counting fingers at 2 meters was 16. Ten of these had operable cataract in one of the two eyes, so the number of incurably blind patients was six. There were 59 persons with one blind eye, and 2 with an enucleated eye, but 13 of the blind eyes were operable for cataracts. The number of permanently blind eyes,

out of 2,000 was 58, and adding 2 cases of anophthalmos this was 3 percent of all eyes examined.

The number of patients sent to other specialists for consultation or treatment was 21 (neurologist 9; internist, aniseikonia specialist 4-4; dermatologist, rhinologist 2-2; allergist, gynecologist 1-1). This number does not include those patients who were advised to see their family doctors.

*Results.* It would be interesting to know how many patients were cured, improved, left unimproved, and so on. However, it is hard to set up the criteria for a cure, and to find out the satisfaction or dissatisfaction of all 1,000 patients. Those who were given prescriptions for glasses and have not returned complaining of some trouble were considered cured. Strabismus patients when supplied with glasses were either cured (eyes straight), or improved (degree of strabismus decreased), or uncertain, or have not returned, or were unimproved. Almost all of the inflammatory conditions and injuries were cured; also the surgical cases. The result was considered in relation to the primary etiologic diagnosis. For instance, a patient with an absolute glaucoma in one eye, and a simplex glaucoma in the other eye, was considered improved if the tension in the fellow eye was normalized.

#### RESULT OBTAINED IN 1,000 CASES

1. No pathologic process .....	48
2. Immateral, or therapy not necessary, or old glasses are good .....	116
3. Cured .....	588
4. Improved (e.g., blepharitis, strabismus, glaucoma) .....	67
5. Referred to other specialists .....	14
6. Uncertain (15 muscle cases) .....	21
7. Not returned (operation advised 35; treatment advised 10; examination not completed 7) .....	52
8. Unimproved or incurable .....	94

1,000

Individuals of the first and second groups were aided by telling them that they had no ocular pathologic change or that their trouble was immaterial or would clear up without treatment, or would not cause trouble for a long time; for example, incipient cataract with vision better than 20/30. The first three groups comprised 752 patients; that is, three out of four patients. The 4th, 5th, 6th, and 7th groups (altogether 153) included patients whose trouble could be arrested or improved. A considerable number of them would probably be cured with surgery (for cataract, ptosis, strabismus, and the like) or treatment. Some of them would ask the help and opinion of other colleagues.

Finally, the last group, which should give us the strongest stimulus, is that of patients with incurable conditions.

- |  |    |
|--|----|
| 1. Not concerning vision   | 20 |
| Telangiectasis of the face and conjunctiva   |    |
| Narrow canaliculi  |    |
| Narrowness of the nasolacrimal duct, not yielding to probing   |    |
| Argyll Robertson pupils  |    |
| Nictitating blepharospasm, nystagmus   |    |
| Ophthalmic migraine. Probably few of these conditions can be improved, let alone cured                                       |    |
| 2. Concerning vision, but that can be improved or cured later  | 14 |
| Cataract, advanced in one eye, the other eye having good vision; or vision in each eye less than 20/30 but better than 20/70 |    |
| 3. Concerning vision, cannot be helped   |    |
| A. Congenital or hereditary conditions   | 12 |
| Pigment degeneration of the retina   |    |
| Malformation of disc   |    |
| Myopia gravis  |    |
| Cortical or macular aplasia  |    |
| B. Inflammation  | 11 |
| Iridocyclitis with amaurosis   |    |
| Central chronic choroiditis  |    |
| Corneal leukoma  |    |
| C. Injury  | 4  |
| Followed by enucleation  |    |
| Choroidal rupture  |    |
| D. Degeneration  | 16 |

Ablatio retinae with amaurosis	
Hole in the macula	
Senile macular degeneration	
Senile central scotoma	
Thrombosis of the retinal vein	
E. Vitamin deficiency with liver damage	1
F. Toxic, or systemic diseases	11
G. Glaucoma absolute	5

Deterioration of the vision was expected in 24. Thus there were 60 patients having incurable conditions with respect to vision. The avoidable pathologic conditions were groups B, C, E, part of F, and G, altogether 16 plus 16/x. The unavoidable pathologic conditions were groups A, D, part of F, and G, altogether 28 plus 16/x.

In a second category the anatomic index, all refractive errors and pathologic conditions according to the anatomic part of the eye were recorded.

#### REFRACTIVE ERRORS

Hyperopia	119
Hyperopia and astigmatism	210
Hyperopic astigmatism	92
Myopia	63
Myopia and astigmatism	115
Myopic astigmatism	50
Mixed astigmatism	68
Presbyopia	243
Aniseikonia	4
	<hr/> 964

#### PATHOLOGIC CONDITIONS

Conjunctiva	126
Cornea	89
Sclera	6
Iris	39
Choroid	30
Lens	110
Vitreous	15
Retina	25
Optic nerve and nervous system	23
Lid	104
Orbit	3
Muscles	129
Lacrimal apparatus	12
Glaucoma	27
Others	48
	<hr/> 786

There were 786 pathologic conditions for 1,000 patients, 1 for 1.27 patients.

Gradle's corresponding ratio was 1 to 1.37 (to 1.57), average 1 to 1.48. The inflammatory conditions of the conjunctiva comprise one ninth of all pathologic processes; this number differs largely from Gradle's who found some form of conjunctivitis in one third of pathologic changes. One can readily accept his explanation for this high incidence: "in a large city there is a great amount of smoke and dirt in the air, and that people are brought into more intimate contact with one another than in smaller cities or in the country."

There were 45 cases, 2.25 percent of the 2,000 eyes, of amblyopia with vision less than 20/40. This is a delicate and slippery diagnosis, and should be made only if the examination under mydriatics does not reveal any pathologic fundus process responsible for the poor vision, if it is in only one eye, if refraction was done under eyeloplegia, and if all possibilities of a pathologic condition were considered, because it is a diagnosis by exclusion. Considering that a large percentage of amblyopia is ex anopsia, patching of the fellow eye in early childhood would have improved the vision in a considerable number of cases.

Bishop Harman's last statistics (4th year, 1937) show the following percentages compared to ours:

#### ERRORS OF REFRACTION

	1937 percentage	My Figures percentage
Hyperopia .....	13.35	11.9
Hyperopia and/or astigmatism .....	39.92	30.2
Myopia .....	4.17	6.3
Myopia—over 5D. in both eyes .....	3.20	
Myopia and/or astigmatism .....	18.70	16.5
Mixed astigmatism ....	5.64	6.8
Odd eyes .....	6.15	
Presbyopia .....	40.61	24.3
	<u>131.74</u>	<u>96.0</u>

#### OTHER EYE CONDITIONS

Diseases of conjunctiva—lids and/or sac .....	7.20	26
Diseases of cornea—all forms .....	2.18	6.5
Diseases of uvea—all forms .....	3.93	5.3
Optic neuritis or atrophy .....	1.15	1.3
Glaucoma—all forms and stages .....	0.79	2.7
Cataract—all forms and stages .....	7.90	11.4
Squint—latent or manifest .....	6.74	12.2
Constitutional diseases with ocular manifestations .....	4.30	3.2
Bad conditions of work .....	0.54	
Injuries or effect of injuries .....	1.09	8.5
Other material conditions .....	3.99	8.2
	<u>39.82</u>	<u>78.0</u>

I tried to break down my figures according to his grouping. This was not possible all along the table, because I did not record separately the odd-eyes (anisometropia), but listed the cases according to the larger amount of ametropia. The great majority in Bishop Harman's statistics were refractions, about 30 percent more refractions, but only half so many pathologic processes listed as in my series. The reason for this difference is that what the National Eye Service patients needed mostly was "just glasses." His compilation proved that even in such patients, the incidence of pathologic conditions was very high.

#### SUMMARY AND COMMENT

In a statistical analysis of 1,000 new, unselected, consecutive eye cases, the main group, 42.8 percent, as was expected, sought help for refractive errors, 15.5 percent for recent and old injuries, 11.8 percent for degenerative conditions. A large percentage (5 percent) had no pathologic condition whatsoever; 68.2 percent were refracted, 41.8 percent of this number under eyeloplegia. The num-

ber of glasses ordered was 403. One out of seven persons came because of presbyopia. A larger percentage of glasses that were ordered by optometrists were changed than of those previously ordered by physicians. Glasses which had to be changed were on the average worn for a shorter time when ordered previously by optometrists than when ordered by ophthalmologists. The number of blind persons was 16, incurably blind only 6. One blind eye was found in 61 persons, and 60 (3 percent) of all eyes were incurably blind.

About 75 percent of all patients were cured, or had no or only insignificant pathologic change. There was a group of 15 percent who were unimproved, uncertain, unfinished, who did not return, or referred to other specialists.

Finally, 1 out of 11 (9.4 percent) patients could not be helped at the time of the examination. When deducting the cases not concerning vision (2 percent), and those with progressive cataract (1.4 percent), there was left a large group of 60 patients (6 percent) whose condition was incurable. Twenty-four (2.4 percent)

even had to expect a further deterioration of the vision. Etiologically, the largest group (16) of the 60 incurable patients were those with senile degenerative conditions. It is my belief that after the great progress made in the direction of prevention (inflammatory diseases, injuries) and after conquering most of the inflammatory eye conditions with the new drugs, the trend of research should be to delay, or prevent, or conquer, the senile degenerative eye diseases.

The large number of amblyopic eyes (2.25 percent) makes it necessary to call the attention of the general practitioner, who sees these squint cases at an early age, to the possibility of improving a great proportion of these eyes by patching the good eye at this age.

The ratio of pathologic processes other than refractive errors, to patients, was 1:1.27 which proves again, to quote Gradle, "the inadvisability of examination of the eyes by individuals not medically trained in the recognition of ophthalmic diseases."

*Old National Bank Building (8):*

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# A METHOD FOR THE EXTRACTION OF DISLOCATED LENSES FROM THE VITREOUS\*

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Displacement of the lens has long presented a perplexing and provoking challenge to the ophthalmic surgeon, and equally perplexing methods of dealing with this problem have been suggested as a possible solution, dating from 1888 to the present day.<sup>1</sup> Displacements are usually divided into two major classifications, the congenital and the acquired types of dislocation. This brief report is primarily concerned with the acquired type of dislocated lens, which may be either traumatic or the result of intraocular disease causing inflammatory or degenerative changes in the zonule of Zinn.

Hitherto, there has been a great deal of controversy as to the best approach and *modus operandi* in dealing with these cases. Some surgeons have deemed it advisable to follow a course of nonsurgical procedure as the lesser of the two evils. Fear of the frequent operative or post-operative complications has been the deciding factor. Others have favored various operative techniques which, in a large percentage of the cases, have been either unsuccessful in expelling the lens, or have resulted in secondary glaucoma, due to trauma during the operation. Knoflach, at the Czechoslovakian Congress of Ophthalmology, in 1931, presented a review of 150 cases, in which he reported that 97 percent of the cases in which operation was performed without iridectomy resulted in secondary glaucoma, whereas 62 percent resulted in secondary glaucoma if iridectomy was done.

Before any course of treatment can be considered, however, the surgeon is faced

with the problem of accurate localization of the lens. In cases of subluxation, whether the lens is transparent or cataractous, its condition may be affected by partial posterior synechiae, as a result of preceding inflammatory processes. The importance of slitlamp examination cannot be overemphasized in cases of this type. Its use in localizing the adhesions of the iris to the lens, the status of the aqueous, the presence or absence of deposits on Descemet's membrane, and the condition of the vitreous are invaluable data. Ultraviolet light can also be utilized to great advantage because of its power of fluorescing the crystalline lens under its beam.

Where nonsurgical procedure is favored, the lens may remain in the pupillary aperture indefinitely. Eventually, however, an irritative iridocyclitis, secondary glaucoma, or complete dislocation of the lens may take place. In addition, the patient is usually inconvenienced by the marked astigmatism and monocular diplopia causing confusing images, so common in cases of subluxation.

If the dislocation is complete, the lens may fall into the anterior chamber, giving the classical appearance of a drop of oil, if still transparent, or a white disc, if opaque. Here, too, the obvious complications are iridocyclitis, hypertension, and degenerative changes ultimately resulting in complete destruction of the eyeball. Should the lens fall into the vitreous, the period of tolerance may be of longer duration, but eventually degenerative processes produced by the action of a foreign body (the lens) irritating the ciliary body and ultimately resulting in a

\* Read before the Eye Section, New York Academy of Medicine, December 18, 1944.

secondary glaucoma, will take place.

If surgery is preferred, the advantage of operating on the partially dislocated lens before complete dislocation occurs, cannot be discounted. Likewise, in cases of congenital dislocations, the chances of obtaining almost normal vision by early surgery are much greater than if the surgeon waits, permitting the patient to go on to adult life with impaired vision due to lack of retinal education. The surgeon is well aware of these facts. Unfortunately, past experience has, all too frequently, brought unfavorable results to his attention, since the literature on the subject, while extensive, provides only apparently unsuccessful methods and techniques of dealing with removal of the dislocated lens.

Otis and Russell M. Wolfe and P. Georgariou<sup>2</sup> described a procedure by which the "lens was speared with a straight needle, then lifted forward and downward. A curved needle was then inserted at the opposite limbus, engaged in the lens, and cross discission performed." It was necessary to repeat this procedure one month later. These authors, however, reported a visual result in only one of their cases, that of a boy six years of age.

Similar techniques of discission, with two needles have been suggested by various surgeons, in the hope that either complete absorption or shrinking of the lens will result. This has been particularly favored in cases of younger patients. The success of such a procedure, however, is questionable and limited to a mere handful of isolated cases. Its advisability must be seriously questioned because of the danger of the lens falling into the vitreous while the surgeon is attempting to pin the lens. The floating lens, surrounded by vitreous, provides an added impediment to absorption, even after satisfactory discission.

Legrand, in his article on dislocated

lenses,<sup>1</sup> speaks of the importance of surgical procedure in acquired cases. His method in dealing with this problem stems from the unfavorable results so common where surgery is performed. Thus, to Legrand, there is no question but that surgery is the only practical method of dealing with these cases. His method consists, first, of placing the patient on his stomach, with the head lower than the feet, thus causing the lens to fall into the anterior chamber. In one case, after the patient was placed in the aforementioned position, Legrand attempted to contract the pupil with eserine. This was unsuccessful. Consequently another method was devised, whereby he placed himself under the head of the patient, inserted the Graefe knife through the cornea into the anterior chamber, leaving the blade in, and removing the handle by unscrewing it. Eserine was applied and the patient turned over on his back. Section was then made and the lens removed with a spoon. This procedure was used in two cases, apparently with success.

Archimede Busacca<sup>3</sup> suggested the following procedure: The pupil is dilated with euphthalmine, the knife needle introduced through the cornea at the limbus and then through the lens. The lens is brought into the anterior chamber and the assistant introduces a Graefe knife into the cornea at the 3-o'clock position through the lens and then at the 8:30-o'clock position. Miotics are then used, and section is performed with some loss of vitreous. The lens is removed with a loop. Similarly, Ewing<sup>4</sup> in his paper, "The broad keratome in the removal of a dislocated lens," described a case in which the lens was dislocated halfway through the pupil and wedged firmly in the outer portion of the anterior chamber, inducing a secondary glaucoma. The keratome was introduced at the temporal side and the blade passed behind the lens, thus fixing





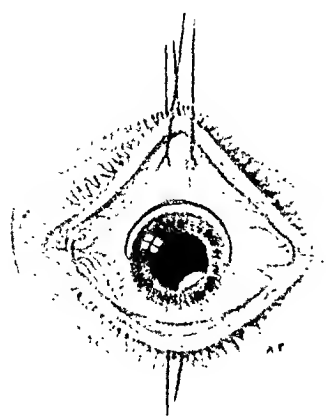


FIG. 1



FIG. 2

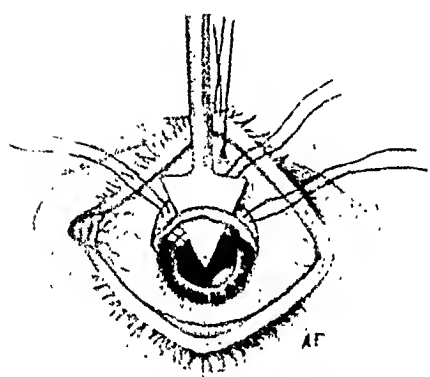


FIG. 3

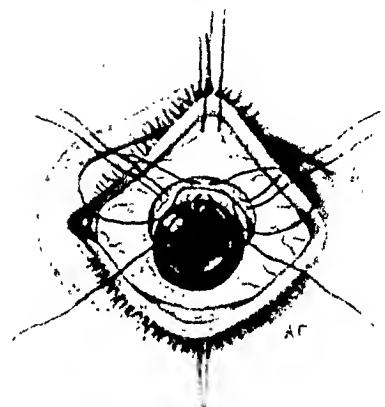


FIG. 4

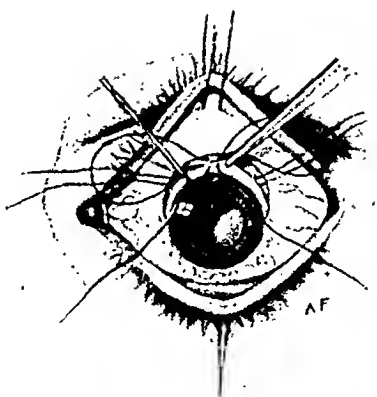


FIG. 5

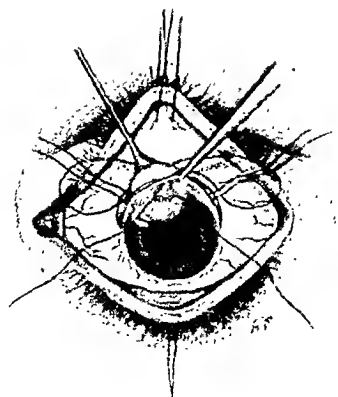


FIG. 6

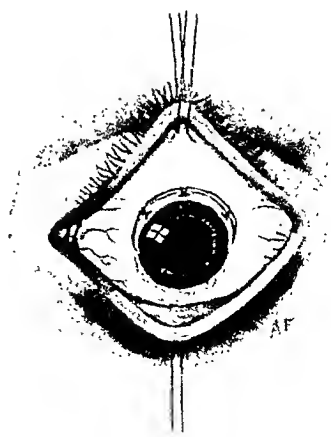


FIG. 7

FIGS. 1-7 (BONACCOLTO). SEVEN STEPS IN THE EXTRACTION OF A LENS DISLOCATED INTO THE VITREOUS.

it. Pressure was then created with Daviel's spoon and the lens was expressed.

The procedures previously described are open to criticism. They apparently involve a good deal of risk, and the cases in which these methods were used appear to have been carefully selected.

A method has been devised whereby the danger of trauma to the eye during surgical procedure has been greatly reduced, the removal of the crystalline lens being much simplified. The results in unselected cases wherein this method was used were favorable. The group to be reported consists of seven cases, chosen at random, in patients who were all successfully operated upon.

#### METHOD OF OPERATION

The procedure used in removing the dislocated lens is similar to that I have employed in cataract extraction. First, akinesia of the facial nerve is obtained. Then follows the retrobulbar injection of novocaine with adrenalin, serving a two-fold purpose; (1) that of anesthetizing and immobilizing the globe, and (2) of concomitantly reducing the intraocular pressure, frequently the cause of the loss of vitreous during the extraction. Sutures are then passed at the margin of the lid (fig. 1) previously injected with novocaine, in order to keep it open, thus (1) eliminating the assistant's task of holding the speculum during the delivery in order to reduce uncomfortable increase in pressure, and (2) facilitating the release of the lids and permitting their closure, should the necessity arise; and (3) preventing accidental increase of intraocular pressure during the operative procedure due to the disturbance of the speculum. Experiments with various types of specula have failed to eliminate this problem.

Bridle suturing of the superior rectus

is helpful because of its aid in rotating the eyeball downward, thus facilitating the section at the superior limbus. This, if combined with the injection of a drop of novocaine at its insertion, serves to reduce the uncomfortable feeling of which the nervous patient frequently complains, thus averting possible loss of vitreous due to the unnecessary contraction of this muscle.

An incision is then made in the conjunctiva, approximately 2 to 3 mm. above the superior limbus, and continued concentric with it, including the superior half of its circumference (fig. 2). The conjunctiva attached to the cornea is undermined as in the preparation for a trephining, so that the margin of the cornea is exposed.

A double-armed, nontraumatic (6-0) silk suture is passed 2 mm. above the superior limbus, the fine threads resting above the upper lids so that they are outside the field of operation. Two additional silk sutures (6-0) are then inserted at the same distance, one on either side of the superior suture. Corneal section is made at the limbus with the keratome, and enlarged laterally with scissors (fig. 3).

Upon completion of the section, the arms of the superior suture are passed through the thin border of the conjunctiva attached to the cornea, from the inner surface to the outer surface (fig. 4). The iris is grasped with the fine forceps near its superior insertion and buttonholed with small scissors.

The two lateral sutures are not passed at this stage. Should the emergency arise, the central one is more than adequate to hermetically seal the sclerocorneal wound. Two loops are left at the side in order to avoid interference with the extraction of the lens.

As the next step the conjunctival flap is firmly held with a smooth, fine forceps,

while a cataract loop is introduced into the vitreous and passed quickly behind the lens, pushing it against the cornea (fig. 5). Then, with a quick traction movement, the lens is expelled from the anterior chamber. By holding down the conjunctival flap the cornea is not permitted to gape widely, and thus, loss of vitreous is prevented (fig. 6).

The superior sutures are gently but firmly tied, and the iris is replaced with a spatula. Following this the auxiliary sutures are passed and tied, the same procedure being utilized as for the middle one (fig. 7).

#### REPORT OF CASES

By this procedure the problem of removing the dislocated lens is simplified, and the danger of surgical trauma diminished. The possibility of the lens escaping into the vitreous is largely reduced by holding the conjunctival flap with the forceps, thereby permitting the loop to push the lens against the cornea and preventing its escape into the vitreous. Thus the lens can be easily expelled by traction without causing the wound to gape during its exit. By this procedure the danger of increased intraocular pressure developing during delivery is eliminated, as well as the loss of vitreous. The three scleral conjunctival sutures permit hermetic sealing of the wound, remove the danger of prolapse of the iris, and similarly reduce the astigmatic error to a minimum. When the surgeon is faced with the choice of surgery this method will provide a means of extracting a dislocated lens from the vitreous with the least possible immediate trauma, and less danger of ensuing complications.

*Case 1.* Mr. L. L., age 56 years, presented upon examination, in the right eye, a cortical cataract, and in the left eye an immature cortical cataract, dis-

located inferiorly. Vitreous protruded into the anterior chamber. He was operated upon on April 26, 1944, and made an uneventful recovery. On May 23, 1944, with a +9.00D. sph.  $\approx$  +2.00D. cyl. ax. 180°, vision was 20/20.

*Case 2.* Mr. D. I., aged 43 years, had had poor vision with the left eye of several years' duration. There was no history of trauma. The right eye was normal, with vision 20/20. In the left eye the lens was incompletely opaque and subluxated in the lower part of the vitreous. Tension was 22 mm. Hg (Schiotz). The patient was operated upon on May 4, 1944, and made an uneventful recovery. On June 10, 1944, with a +9.00D. sph.  $\approx$  +1.50D. cyl. ax. 20°, vision was 20/20—.

*Case 3.* Mr. W. M., aged 36 years, had had chronic uveitis, in the right eye, of unknown origin, for eight years. All laboratory and X-ray tests proved to be normal. In 1941 a cataract began to develop, and in 1943 the lens became dislocated. On examination the right eye presented some very minute deposits on Descemet's membrane. The lens was completely cataractous and dislocated in the inferior portion of the vitreous. The left eye was normal, with vision 20/20—. The patient was operated upon on May 25, 1944, and the lens extracted from the vitreous. He made an uneventful recovery, with no loss of vitreous. On July 10, 1944, with a +10.00D. sph.  $\approx$  +1.00D. cyl. ax. 60°, vision was 20/30+. Descemet's membrane presented almost no deposits.

*Case 4.* Mr. N. G., aged 44 years, had suffered intermittent attacks of choroiditis in the left eye for nine years. Upon examination, on July 10, 1944, the left eye presented some pigment deposits on Descemet's membrane, but the aqueous

ray was negative. The lens was cataractous, with some calcified areas, dislocated superiorly, temporally, and nasally, but still adherent to the inferior border of the pupil. The right eye was normal, with vision 20/20. The patient was operated upon on July 19, 1944. Before the lens was looped, it was necessary to separate the posterior synechiae. Recovery was uneventful. On July 20, 1944, vision was improved to 20/100 with +10.00D. sph.  $\ominus$  +1.00D. cyl. ax. 15°. The fundus presented numerous areas of old chorioiditis.

*Case 5.* Mrs. A. F., aged 60 years, came to the Manhattan Eye, Ear, Nose and Throat Hospital with a painful, blind right eye. Vision in the left eye was reduced also. On examination, the right eye presented severe conjunctival argyrosis, acute glaucoma, and nuclear cataract. The left eye presented a nuclear cataract. The patient had an iridectomy performed on the right eye on August 22, 1944. Recovery was uneventful, but upon examination on November 1, 1944, a subluxation of the lens, in the inferior portion of the vitreous, was revealed. The patient was operated upon on November 7, 1944, for dislocation of the lens. There was no loss of vitreous.

*Case 6.* Mr. J. J., aged 65 years, presented, upon examination, a chronic simple glaucoma in the right eye. There was a Morgagnian cataract in the left eye, luxated in the lower part of the vitreous. The patient was operated upon on August 16, 1944, and had an uneventful recovery. On September 20, 1944, with +11.00D. sph.,  $\ominus$  +2.50D. cyl. ax. 180°, vision was 20/40. Tension was 24 mm. Hg (Schiøtz).

*Case 7.* Mrs. R. G., aged 50 years, had had her right eye enucleated three years ago, following an absolute glaucoma. On November 3, 1944, she presented a dislocated, black cataract in the left eye. It was still suspended by a few fibers of the zonule at the 12- and the 6-o'clock positions, so that the lateral equatorial edge was presenting and protruding into the anterior chamber. Tension was equal to 45 mm. Hg (Schiøtz). The patient was operated upon November 20, 1944, and made an uneventful recovery. Ophthalmoscopic examination revealed numerous myopic atrophic areas of the choroid. On December 23, 1944, with +5.00D. sph.  $\ominus$  +1.50D. cyl. ax. 180°, her vision was equal to 20/40. Tension was 22 mm. Hg (Schiøtz).

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#### REFERENCES

- <sup>1</sup> Legrand, J. Arch. d'Opht., 1938, v. 2, p. 924, quoting Agnew of New York and his preference for the "bident hook" for the removal of a dislocated lens in 1888.
- <sup>2</sup> Wolfe, O. R., Wolfe, R. M., and Georgariou, Pierre. Amer. Jour. Ophth., 1943, v. 26, p. 1313.
- <sup>3</sup> Busacca, A. Ann. d'Ocul., 1932, v. 169, pp. 274-281.
- <sup>4</sup> Ewing, A. E. Ophth. Rec., 1911, v. 20, pp. 666-668.

# RESTORATION OF PATENCY OF THE NASOLACRIMAL DUCT BY MEANS OF A VITALLIUM TUBE

## A PRELIMINARY REPORT

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Many attempts have been made to restore the patency of the obstructed lacrimal passages by means of curettement, diathermy,<sup>7, 12</sup> or electrolysis and the use of probes, styles, and tubes. Any of these procedures may, at times, be successful, but since, for the most part, they have failed, they have, to a large extent, been supplanted by the various types of dacryocystorhinostomy.

In the past, when styles or tubes were introduced into the nasolacrimal canal, they were usually designed to be removed at a later date. As a rule, the upper end of the tube or style was bent and left projecting either from a canaliculus or from an incision into the sac at the inner canthus, so that it could be pulled out later. Callahan<sup>1</sup> used a soft, thin-walled silver tube which was later pulled out through the nose.

In the past, there has been a justifiable aversion to putting tubes in the lacrimal canal and leaving them permanently, because of the well-known surgical fact that most metals, when buried in the tissues, caused a foreign-body reaction which varied from a mild inflammatory cellular infiltration to fibrosis or even necrosis.

In 1937, Venable, Stuck, and Beach<sup>9</sup> carried out extensive experiments on dogs as to the effect on the tissues of metals implanted in bones. Not only the macroscopic changes were noted, but the histologic and roentgenologic changes as well. Biochemical studies, also, were made of the tissues, the exudates around the metals, and of the metals themselves. They demonstrated conclusively that all of "the metals commonly used in surgery were

subject to electrolytic activity in body fluids," and, that "the extent of tissue damage was roughly equivalent to the amount of galvanic action which took place." In the case of pure metals, there is, of course, no galvanic action, and whatever reaction does take place is due to a chemical action of the body fluids on the metal. The metal used for lacrimal tubes in the past was usually gold or silver. The gold was, of course, not pure gold, but an alloy, so galvanic action would occur, and sterling silver is 925/1,000 silver, so here, also, electrolytic action and a chemical reaction as well would take place when the metal was surrounded by body fluids. The so-called "foreign-body reaction" is not, as the name would imply, a protest on the part of the tissues to the mere presence of a foreign substance; it is an inflammation due to chemical or electrolytic activity in the substance and in the absence of such activity there is no "foreign-body reaction."

In the course of their experiments, Venable, *et al*,<sup>10</sup> found only one metal free from chemical and electrolytic activity in human serum and, therefore, completely inert in the body, an alloy named Vitallium.\* (The approximate composition of Vitallium is cobalt 65 percent, chromium 30 percent, and molybdenum 5 percent.)

The first clinical case in which Vitallium was used was in 1936. Since then, its application has become widespread;

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\* Vitallium is a product of the Austenal Laboratories, Inc., 224, East 39th Street, New York City.

first in bone surgery, but later in appliances in many fields of surgery other than orthopedics. Its first recorded use in ophthalmology was as material for orbital implants by Doherty.<sup>2</sup>

Pearse<sup>5</sup> reported the successful use of Vitallium tubes in stricture of the common bile duct. He found that Vitallium tubes placed in the common bile duct of dogs remained patent without erosion of the metal or deposition of pigment salts on them.

Lord and Eckel<sup>3</sup> reported on the use of Vitallium tubes in the ureters of dogs. They stated that no stone, gravel, encrustation, or other pathologic abnormality occurred on the tubes and that the latter retained their original luster over a period of nine months.

It seemed to me that such a metal would be an ideal material for a tube to be placed permanently in the bony nasolacrimal canal to restore its patency in cases of stenosis, and I have used such a tube in four cases with, so far, very gratifying results.

The operation is performed as follows:

The sac is exposed by a curved incision in the skin, beginning at the level of the internal canthal ligament, 3 mm. medial to the inner canthus, and extending downward concentrically to the anterior lacrimal crest for a distance of about 13 mm. The internal canthal ligament need not be cut, and the incision need not be so large as for a dacryocystorhinostomy or a dacryocystectomy. The orbicularis fibers and deep fascia are divided with scissors and blunt dissection, exposing the lower half of the sac. A small incision is made on the anterior surface of the sac near where it enters the bony canal. An oval spoon curette is introduced through this opening and passed into the bony canal, the walls of which are then thoroughly curetted. The probe is withdrawn, and the Vitallium tube, held with narrow conjunctival

forceps one blade of which is in the lumen of the tube, is inserted through this opening into the bony canal and pushed downward until the shoulder rests on the rim of the canal. The tube is rotated so that the shoulder points outward and temporally. The incision in the sac is closed with a single 000 plain catgut suture. The orbicularis and deep fascia are closed with several similar sutures and the skin is closed with a running dermal suture. A pressure bandage is applied and left in place for from three to five days. The skin suture is removed on the sixth day. Irrigation of the canal, through the upper or lower punctum, is done from one to two weeks after the operation.

The procedure is designed only to restore patency of the bony canal, which, in most cases, is the site of obstruction. Strictures in the sac itself must be treated by probing, irrigation, or other means. However, strictures in the membranous sac may be in part inflammatory and, when adequate drainage of the infection below is established, may clear up, at least to the extent of allowing the passage of tears. This was found to be the fact in two cases. (It is possible that strictures of the membranous sac, such as are found after wounds and fractures across the sac, might be relieved by a tube longer than the one described, with a shoulder separating the part in the sac from the part in the bony canal. Such a tube could be inserted either through an incision extending the whole length of the sac, or through an incision at the inner canthus, in front of the caruncle, into the upper part of the sac.)

The use of a Vitallium tube, as just described, has several definite advantages over a dacryocystorhinostomy, not the least of which are its simplicity and freedom from secondary nasal hemorrhages. In the intubation operation, once the sac is exposed, the operation is practically



Fig. 1 (Muldoon). Case 1. Front view showing tube in the lacrimal duct.

over, whereas in dacryocystorhinostomy, it is just the beginning. Both dacryocystorhinostomy and intubation accomplish the same end—that is, the making of a passage for tears to drain into the nose—and the intubation does it in a more anatomic manner.

There is considerable normal variation in the diameter<sup>6,11</sup> of the bony nasolacrimal canal in different subjects but, in most cases, a tube with an outside diameter of 3 mm. can be easily inserted. In their manufacture the tubes have to be cast, and the walls cannot be cast with a thickness much less than 0.5 mm.\* Since this is the case, a tube with an outside diameter of 3 mm. would have an inside diameter of 2 mm., which, apparently, is sufficiently large for good drainage.

In the first case, the only tube available was a straight tube with a shallow groove near either end, such as had been used by Blakemore *et al.*,<sup>4</sup> in their work on arterial anastomosis. The outside diameter of the tube was about  $3\frac{1}{2}$  mm., the inside

diameter  $2\frac{1}{2}$  mm., and the length 18 mm. It was possible to push it into the duct after curettement, but it was a tight fit and would undoubtedly be too large in some cases. In the second case, I had a tube made with an outside diameter of 2 mm. which, since the walls of the tube have to be almost 0.5 mm. thick, left an inside diameter of only a little over 1 mm. The tube was 18 mm. long and had a narrow shoulder on one side of the upper end to prevent its slipping down into the nose. The lower end of the tube was slightly tapered. This tube slipped into the duct very easily and, although it apparently functioned well, it would seem desirable to use a tube with a slightly larger inside diameter whenever possible. In the last two cases, the tube used had an outside diameter of slightly less than 3 mm. and an inside diameter of 2 mm. It was 18 mm. long, the lower end slightly tapered, and the upper end had a narrow shoulder on one side. The length of 18



Fig. 2 (Muldoon). Case 1. Side view, showing tube in the lacrimal duct.

\* Since Vitallium is very hard, it cannot be drawn into tubes and must be cast at a high temperature. The difficult problem of casting Vitallium tubes of this length and diameter was solved by Mr. E. J. Duffin of the Duffin Laboratories of San Antonio, Texas.

mm. insures the tube's projecting several millimeters into the nose, which is advantageous in that there is sometimes a membranous<sup>11</sup> canal in the nasal mucous membrane at the lower end of the bony duct.

#### REPORT OF CASES

*Case 1.* Mrs. C. A., aged 32 years, had had epiphora and a mucopurulent discharge from the tear sac on the right side for over a year. It had been treated by probing and irrigation without permanent benefit. She had had two acute attacks of dacryocystitis during this time, which necessitated hospitalization and medication with large doses of sulfa drugs. The infection subsided without incision or rupture of the sac. Three weeks previous to operation, she had a third attack and developed an abscess which ruptured spontaneously and resulted in the formation of a fistula in the skin overlying the sac.

On March 7, 1945, the operation was performed as herein described, with the patient under sodium pentothal anesthesia. A perforation was found in the anterior wall of the sac which communicated with the skin fistula, and the



Fig. 3 (Muldoon). Case 2. Front view, showing tube in the lacrimal duct.



Fig. 4 (Muldoon). Case 2. Side view, showing tube in the lacrimal duct.

wall of the sac around the perforation was necrotic. Penicillin, 100,000 units in doses of 10,000 units every three hours, was administered beginning 24 hours, postoperatively. One week after the operation, the skin incision and fistula had healed; two weeks after the operation, saline solution tinted with fluorescein injected into the lower canaliculus, passed freely into the nose.

*Case 2.* Mrs. M. E. G., aged 80 years, had suffered with epiphora for several years. Her chief complaint, however, was that a tense, painful swelling would appear in the region of the tear sac and remain for several weeks. It could be reduced only by firm and long-continued pressure, which would finally evacuate mucopus into the conjunctival sac. She had had four acute attacks in the last two years, the present attack having begun three weeks previous to operation. On the day before the operation, I was unable, with any safe amount of pressure, to empty the sac. Further, when saline was



injected into the lower punctum, it immediately returned clear through the upper punctum and did not change the size of the swelling, indicating that there was a stricture in the upper portion of the sac in addition to the obstruction in the bony canal.

On March 29, 1945, with the patient under intravenous pentothal-sodium anesthesia, a Vitallium tube was inserted in the bony canal in the same manner as in the previous case. Following operation, there was considerable swelling of the lids, due, probably, to extravasation of saline into the tissue of the lids when an attempt was made to force fluid into the sac through the lower punctum at the time of operation. The patient was given 100,000 units of penicillin in doses of 10,000 units every three hours, postoperatively. Convalescence was uneventful. The swelling in the tear-sac region has not recurred. There is a slight epiphora, of which the patient does not complain.

*Case 3.* Mrs. B.-B., aged 59 years, had had epiphora of the right eye for four or five years and, in addition, mucopurulent material would form in the sac, which she could evacuate by pressure over the sac. In the last six months, the condition had become very troublesome and she had to press out the secretion more often.

At the last preoperative examination, the sac could be emptied readily by slight pressure over it; also, the contents of the sac could be washed out easily by irrigation through either punctum.

The patient had a mild diabetes.

On April 24, 1945, with the patient under intravenous pentothal-sodium anesthesia, the sac was exposed, the duct curetted, and a Vitallium tube inserted into the bony nasolacrimal duct. The patient had an uneventful convalescence and was dismissed from the hospital on the third

day. The discharge from the sac has entirely cleared up, and there is no epiphora. Fluorescein solution, dropped in the eye, appears later in the nose.

*Case 4.* Mr. C., aged 57 years, had been struck on the back of the head by a heavy falling weight 17 years previously. The accident caused a skull fracture, and knocked him forward on his face, so that a fracture of his nose and most of the facial bones and both orbits resulted. The right eye was displaced downward about 1 cm. and there was a paresis of all the extraocular muscles except the internal rectus. He had had considerable plastic work done for the nasal deformity but later developed a carcinoma in the scar tissue which was treated with radium, and the graft melted away, causing a recurrence of the deformity. The left eye showed no impairment of vision or motility. He had had tearing on the left side, however, since the accident. Later, in the region of the tear sac a swelling appeared, which he was able to reduce by pressure. The contents could be evacuated into the nose until about six months ago, when he could no longer press the secretion into the nose, but could empty it into the conjunctival sac.

Examination showed the sac to be enormously distended. Considerable pressure was necessary to express its contents into the conjunctival sac. Fluid could be injected easily into the sac through either punctum, but would not pass into the nose.

On April 26, 1945, with the patient under intravenous pentothal-sodium anesthesia, the operation was performed. The anatomic landmarks had been destroyed, so the incision had to be made where the sac could be felt. The sac was exposed and incised, and a probe introduced into it. No bony duct could be found, so a large Ziegler probe was thrust into the

nose in the location where it was thought the nasolacrimal duct should be. The probe was located in the nose by a probe passed through the nares. The probe was withdrawn and a Vitallium tube pushed through the same passage. There was considerable nasal hemorrhage, which was controlled with a nasal pack. The nasal pack was removed the next morning, and the patient discharged from the hospital on the third day, postoperatively.

Since the operation, the sac still fills up, but it has not become distended and the patient is able, by pressing, to empty it into the nose. The secretion which is washed out of the sac is more mucoid and

less purulent than before.

The result in this case has not been so good as in the foregoing three cases. It probably would have been better if a larger tube had been used. The patient, however, feels he has been benefited by the operation.

The first two cases in which I used a Vitallium tube were in patients of Dr. Robert E. Parrish, whose coöperation is gratefully acknowledged.

I am indebted to Dr. C. S. Venable for his assistance and advice.

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# EXPERIENCES WITH THE SURGERY OF THE ANOPHTHALMIC ORBIT\*

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It has been a recent privilege to supervise the fitting with artificial eyes of a large number of anophthalmic sockets. A majority of these sockets were the result of enucleations performed some years prior to entry into the Service. A smaller number were comparatively recent battle casualties. The patients did not originate from any one section of the country, but probably presented a good cross section of anophthalmic orbits. A number of interesting problems have presented themselves; some have been solved, others require further investigation.

Possibly the commonest single cosmetic blemish remaining after the fitting of an artificial glass eye is the sinking or retraction of the upper lid associated with a loss of the usual crease. To account for this certain theories have been advanced by several observers.

(1) The possibility presents itself immediately that the loss of the globe alters the direction of pull of the levator palpebrae muscle so that it pulls backward, rather than upward.

(2) Loss of orbital tissue, such as occurs when a depressed fracture of the inferior orbital wall permits the orbital contents to enter the antrum, produces a most disfiguring depression in the upper lid. This depression can be entirely eliminated by mechanically raising the orbital content to its former position.

(3) Traumatic atrophy of the orbital fat has been postulated following severe injury. Pfeiffer<sup>1</sup> has demonstrated satisfactorily that such cases are usually, if

not always, associated with an unrecognized fracture of the orbital floor. It has, however, been observed here that sinking or retraction of the upper lid may not be noticed for some months after the initial installation of an artificial eye. This suggests a delayed atrophy of orbital tissue.

(4) Dimitry<sup>2</sup> has suggested that the overlapping of the recti muscles across the implant is responsible for this defect. The inferior rectus muscle pulls the superior rectus downward and it, in turn, by means of its fascial attachments, pulls the levator downward and so causes a depression of the upper lid.

(5) Artificial eye makers<sup>3</sup> have observed that when a large implant is present in an orbit, it may be sufficient to destroy the fold in the upper lid, and so produce an apparent ptosis.

Whatever may be the cause of this defect, its remedy presents a difficult problem. The surgeon first usually attempts to obtain the best prosthesis possible and refers the patient to the artificial-eye makers. A certain number of these defects can be improved by fashioning a thicker or differently shaped prosthesis. In only the relatively minor degrees of sinking, however, can a good result be effected by this means. Gougelman<sup>4</sup> has stated that he has repeatedly attempted to overcome this difficulty by adapting a fuller eye, but that the fullness thus produced is unnatural and far less pleasing than the original condition. The use of a larger prosthesis produces an unsightly stare. A flange or bolster placed on the top of the prosthesis merely lifts the upper lid and exposes the sclera above the iris. He has stated that a better cosmetic appearance will result by the inser-

\* Presented, in part, before the New York Academy of Medicine, Section of Ophthalmology, February 19, 1945, and the New England Ophthalmological Society, March 20, 1945.

tion of a smaller prosthesis which permits a partial closure of the fissure.

We have attempted to meet this problem by several different procedures: (a) By careful attention to the dissection of the superior rectus muscle at the time of enucleation, so that its attachments to the levator can be severed. (b) Delayed implantation of a glass sphere. (c) Implantation of cartilage in the floor of the orbit, in cases of depressed fracture. (d) Dermal graft to the upper lid.

On the theory that the superior rectus muscle tends to pull the levator muscle down by means of its fascial attachments, particular attention has been paid in selected cases to careful separation of the superior rectus muscle from the levator palpebrae. Results have been inconclusive. On discharge from the hospital, some patients have presented an upper lid in excellent position, but follow-up examinations have not been satisfactory because of the exigencies of the military service. It must also be admitted that patients, to whom no attention has been paid as to separation of the superior rectus muscle from the levator, have also left the hospital with satisfactory upper lids. One such patient who returned three months later was observed to have developed some of the characteristic sinking. This was not present when he left the hospital.

It has been surprising to observe the number of enucleations which have been performed without an immediate implantation in Tenon's capsule. My figures are not complete on this point, but more than 50 percent of the patients seen have not had an implant in position. It is also my impression that these patients without implants have more frequently presented the unsightly retraction of the upper lid than have the patients with implant. However, it again must be admitted that patients with apparently satisfactory implants have also presented this defect on

numerous occasions; whereas some patients without implant have a cosmetically excellent appearance.

When presented with such a patient, the primary procedure has frequently been the implantation of a sphere in Tenon's capsule. It has been questioned whether one actually finds Tenon's capsule when making these delayed implants. It appears to me very doubtful that this can be done under general anesthesia, except by accident. After an enucleation the collapsed capsule may be displaced to one side or the other, provided no sphere is implanted at the time of enucleation. Under local anesthesia the displaced capsule can be found by observing the source of attachment of the recti muscle as demonstrated by conjunctival dimpling when the muscles retract. I have repeatedly entered a definite fascial plane between either the vertical or lateral recti when the dissection has been done under local anesthesia and the muscle insertion could be identified by having the patient frequently move his eyes, from side to side or up and down. Into this tough fibrous envelope, it has not been difficult to insert a sphere of about 14 to 16 mm. in diameter in the manner described by Wheeler.<sup>5</sup> Such an implantation is, however, not always necessarily in the midline. This may be because the capsule itself has been displaced when its walls were not held apart by an immediate implant. A sphere implanted in the capsule does not move out of position unless the capsule is torn. If such a tear occurs during the operation, as evidenced by the herniation of orbital fat into it, I immediately suture the rent. If an attempt is made to implant a sphere in the geometric midline, without reference to the capsule, it will usually migrate to some other position. Consequently, it is probably better to place the implant in its proper capsule, even though it be eccen-



Fig. 1 (DeVoe). Case 1, depressed fracture of orbital floor with intact rim, before cartilage and after sphere implantation.



Fig. 2 (DeVoe). Case 1, after cartilage implantation.

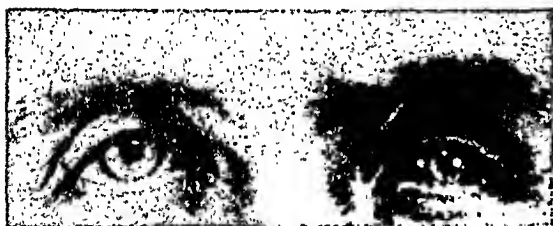


Fig. 3 (DeVoe). Case 2, depressed fracture of orbital floor and rim before operation.



Fig. 4 (DeVoe). Case 2, after cartilage implantation.

previous attempts made at implantation of spheres; rarely were they centrally placed when I saw them. Frequently, they had migrated inferiorly and forward to such a degree that a painful ledge was formed in the lower cul-de-sac upon which ledge the prosthesis had to rest. At times, it has been physically impossible to insert a prosthesis because of lack of space, and there has been no recourse but to remove the implant. In other individuals, the sphere had migrated up and temporally. Usually, such migrations have produced so much discomfort when an artificial eye is worn that its removal has been necessary. It must be conceded that, in general, delayed implants are not satisfactory. If the artificial-eye makers are consulted they will agree that they would much prefer to fit a socket without implant than one which has had a delayed implant. They all greatly prefer a primary implant at the time of enucleation, however. The delayed implant, properly performed has not, in my experience, been of much help in reducing the sinking of the upper lid. In part, this may be because it is impossible to implant a sphere much larger than 16 mm. in diameter, without its extrusion either anteriorly through the conjunctiva or posteriorly into some other part of the orbit. Such a sphere does not add greatly to the orbital volume. We have nevertheless found this procedure to satisfy some patients, and, since it is a simple one, it should probably be tried in patients who have a small amount of disfigurement. It does not seem to improve the movement of the prosthesis. This depends on the retraction of the conjunctiva and may be present whether an implant is in position or not.

In all cases of a severe apparent enophthalmos, or sinking-in of the upper lid in an anophthalmic socket, it has been found worth while to look for roentgenologic evidence of depression of the orbital floor. Such an injury is not rare,

trick, than to place it in the geometric center of the orbit. It has been my lot to serve at an end station for sockets which have been difficult to fit with satisfactory prostheses. Many of the patients have had

particularly in the case of war wounds. When such a condition is present, the depression in the upper lid may be entirely obliterated by subperiosteal implantation of cartilage, either preserved or autogenous, in the floor of the orbit (figs. 1 to 4). Preserved cartilage is well tolerated and simpler for the ophthalmic surgeon to use. Several points have appeared to us important: first, the cartilage should be placed as far posteriorly in the orbit as possible, so that in effect it tends to push the orbital content upward and forward; secondly, the cartilage should not be carried to the anterior rim of the orbit. If this is done, it will have a tendency to raise the entire palpebral fissure above that of the other eye. It will further obliterate the inferior cul-de-sac and make the fitting of an artificial eye difficult. An area several millimeters behind the orbital rim should be left free of implanted material. Then there will be sufficient room for the lower rim of the prosthesis when it is inserted. To maintain the cartilage in position and prevent its slipping anteriorly, it may be sutured to the overlying periosteum. At the conclusion of the operation a mold or artificial eye is inserted in the socket and a pressure dressing applied. It is probable that a satisfactory result can be obtained in some patients by this procedure, even though there be no fracture of the orbital floor. I have not, however, attempted this.

If a real cosmetic blemish persists after the delayed implantation of a sphere and the proper procurement of an artificial eye (fig. 5) it may be improved considerably by implantation of dermal grafts in the upper lid.<sup>6</sup> Fat grafts have been found to liquefy and to become absorbed, so that there is practically no change in the appearance of the lid after a few months have passed. I have found, that the former procedure is satisfactory in a small group of cases; also that the defect



Fig. 5 (DeVoe). Case 3, before dermal graft in upper lid.



Fig. 6 (DeVoe). Case 3, three weeks after dermal graft in upper lid.

must be greatly overcorrected at operation, because of the tendency of the implanted material to become absorbed. For donor material, I use the thickest skin easily obtainable; that is, from the back. Two layers of this thick skin are implanted high and superficially beneath the skin of the upper lid. It has been found helpful to suture it into position, as high as possible, in order to prevent its sinking downward, during the immediate postoperative period. To accomplish this, an incision is made about 20 mm. in length just below the brow and the area undermined extensively beneath the skin. In this way, the graft can be placed exactly where desired under direct vision. It can be easily sutured into optimal position. Postoperatively, a rather alarming ptosis may develop, and the defect may appear to have been grossly overcorrected (fig. 6). Within four to six weeks, however, it will be found that sufficient absorption of the dermal tissue will have occurred, so that the cosmetic appearance will be an

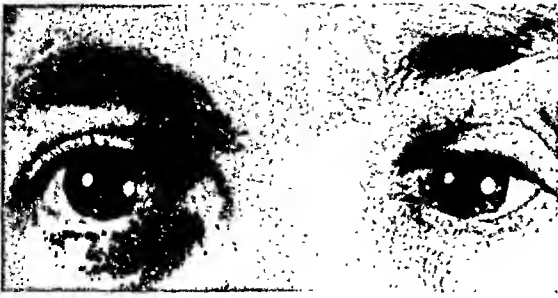


Fig. 7 (DeVoe). Case 3, three months after dermal graft in upper lid.

improvement over the original condition (fig. 7).

Probably the next most common serious deformity associated with the wearing of an artificial eye is that which may appear rather late after the wearing of any eye for many years. In a few battle casualties, the same condition has appeared within a year after a prosthesis has been worn. This condition is apparently due to a relaxation of the orbicularis muscle and is manifested by a loss of tone in the lower lid, frequently to such a degree as to make the retention of a prosthesis impossible. Bending over to tie a shoe or wash the face, may be sufficient to cause the eye to fall out. I have sent these patients repeatedly to the artificial-eye makers and only after all attempts to produce and retain a satisfactory prosthesis have failed have I resorted to surgery. In the individuals who have an adequate cul-de-sac, but weak lid musculature, I have first tried restoring the muscle tone. This has been done by employing the Wheeler orbicularis-shortening procedure, such as he<sup>7</sup> used for spastic entropion. Instead, however, of taking a band 4 to 5 mm. in width, one at least twice that width is taken, preferably as wide as the entire lid. This has been done in only four cases. Two were successful to a degree that the patient was able to retain his prosthesis in all ordinary activities. Two others were not satisfactory and required further surgical intervention.

When this procedure has failed success has been uniformly attained with the following surgical steps: The conjunctiva is incised about 5 mm. below the lower margin of the tarsus and dissected free superficially upward to the tarsal border. With scissors a lower fornix is dissected exactly as in the manner in which a total-socket reconstruction is made; that is, the dissection is carried behind the orbicularis muscle down to the inferior orbital rim. Three double-arm sutures are then passed through the lower margin of the conjunctival flap, deep through the bottom of the new fornix, passing through periosteum if desired, in the manner described by Weeks,<sup>8</sup> to the skin surface, where they are tied over rubber tubing. A mucous-membrane graft is then taken from the lip or buccal cavity and inserted so as to cover the denuded area in the socket. It is firmly sutured into position with fine silk, and a mold of dental compound placed in position so as to maintain a proper contour of the cul-de-sac. The usual pressure dressing is applied for a week, and the lid sutures are removed at about that time. The conjunctival sutures may be removed on the tenth day, if desired, although most of them will probably have fallen out by that time. One patient had a severe hemorrhage from the socket on the fifth day. To my surprise, the graft took perfectly. It has, however, discouraged any attempt to remove the mold or sutures at an earlier date. These mucous-membrane-lined sockets have been found to be most satisfactory. They are free from objectionable odor and discharge. The Russians<sup>9</sup> have stated that a similar result can be obtained merely by performing the dissection without inserting a mucous-membrane graft. They insert a mold and allow the epithelium to grow downward and cover the defect. I have not attempted this procedure. In some instances, if sufficient conjunctiva remains in the upper

fornix, it is possible to secure an adequate lining for the new fornix by shifting conjunctival flaps rather than by inserting a graft.

Mucous-membrane grafts have not been very popular with ophthalmic surgeons. Spaeth<sup>10</sup> has stated that the only defect in which a mucous-membrane graft should be used is for the correction of conjunctival defects with an intact eyeball. However, I have found the mucous-membrane graft to have its greatest use in reconstruction of a partially defective anophthalmic socket. It matches the palpebral and orbital conjunctiva quite well within a short time and, most important, does not cause offensive discharge or odor. But when such grafts are applied directly to the bulbar conjunctiva, they are deservedly unpopular among surgeons because of their unsightly thickness and color. I agree that they should be used in such position only in extreme necessity.

It has been my experience that skin grafts should be avoided in the socket, if at all possible. In instances of complete socket reconstruction, it is of course impossible to procure enough mucous membrane to line a socket completely. Split-thickness grafts are then in order. In some cases of partial loss of the socket, it has been possible with repeated mucous-

membrane grafts to effect a reconstruction. A socket lined partially with mucous membrane and partially with skin is an extremely annoying one to the patient. Discharge is profuse, and ill smelling. Secretion cakes on the prosthesis rapidly, so that its appearance is as unpleasant to the observer as to the patient. Such patients have been grateful for the removal of either the skin or the mucous membrane, preferably the skin, if possible. The criticism may be raised that those skin grafts which produce an unpleasant discharge are too thick and contain secretory elements of the skin. I have seen such sockets, however, in which there has been no evidence of hair growth, but all have had some mucous membrane remaining, usually at the lid margin. If this can be excised and replaced with skin the discharge will greatly lessen.

#### COMMENT

The satisfactory installation of an artificial eye depends to a large degree upon the interest and coöperation of the artificial-eye maker. In certain cases, however, even their best efforts will not produce a cosmetically satisfactory result. Then, at times, the surgical measures herein described may find a field of usefulness.

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## MEGALOCORNEA\*

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Megalocornea has been reported somewhat infrequently, and it is therefore understandable that it is far from completely and undebatably accepted from genetic, therapeutic, etiologic, biomicroscopic, and even nosologic standpoints. It is with an aim at clearing, or at least calling to mind, these still undetermined factors in this interesting, although somewhat rare anomaly, that this single case report is offered.

The patient, a soldier, aged 26 years, came to the eye department for refraction. In the course of the examination the extremely large size of his eyes was most striking. The patient's only eye complaints were of his slight nearsightedness and his poor vision at night. He had worn glasses for the past 15 years, had had his eyes refracted at fairly frequent intervals by optometrists, had noted no rapid progression of his nearsightedness, and had always been comfortable with each change of glasses. He was aware of inability to see at night, for rarely did he venture out alone until his induction into the Army, when this deficiency became much more evident.

The patient's maternal great-grandfather and paternal great-grandmother were cousins. His mother was of German extraction, although born in the vicinity of Odessa. She came to America when only 20 years of age, and married the patient's father, a farmer in North Dakota, who had the same last name. Of this marriage there were seven boys and two girls, and of the seven boys three have "those same large eyes." The

oldest male, 45 years of age, was rejected in the last World War primarily because of night blindness and poor general vision. The younger sister's first-born, five years old, also has very large eyes. The patient also relates that one uncle had the very large eyes characteristic of some of the members of the family.

### EXAMINATION

Physical examination disclosed a somewhat large and obese adult whose disinterested appearance and general lack of ambition were obvious. There was no motor anomaly, lid nor lacrimal-apparatus disturbance. The cornea of the right eye measured 16 mm. in the horizontal meridian, and 15 mm. in the vertical meridian; that of the left eye measured 16.5 by 15 mm. in similar meridians. The corneas appeared perfectly symmetrical. There was no evidence of scarring of the cornea and no signs of folds, either vertical or horizontal in Descemet's membrane.

*Embryotoxon.* The lower and upper portion of the cornea of each eye, near the limbus, presented a marked embryotoxon, much more pronounced in the lower portion of the cornea than in the upper. The arcs were incomplete at nasal and temporal ends where they narrowed in typical lunar character. The inferior crescent was separated from the limbus by a thin area of almost clear cornea. No vessels were present in this arcus. With the narrow beam of the slitlamp the embryotoxon was seen to project, or cause the anterior surface of the beam to bulge forward slightly. The buff-gray color of the embryotoxon involved the entire thickness of the corneal substance. There was present just the narrowest possible lucid

\*The author has left the country for service overseas, and his author's proof of this paper is therefore not available for corrections.

interval, so that except by retroillumination the arcus appeared to be continuous with the limbus. There was no evidence of "hour-glass" formation, for the entire stroma appeared involved. The arcus of the upper portion of the cornea was different from that of the lower cornea, being crescentic in shape, grayish in color, and it showed an increased corneal relucency. The structure seemed much thinner and resembled an area of the

usual and were visible much farther centripetally than is usually observed.

*Anterior chamber.* The anterior chamber was 7 mm. deep and of equal depth in each eye. When the patient looked down, the deep chamber acted much like a contact lens, making the angle of the chamber readily visible (fig. 2).

*Aqueous flare.* When the anterior chamber was viewed through a small but intense spot beam after becoming properly



Fig. 1 (Rosen). General overall view of eyes, showing large cornea and arcus senilis.

limbus which had been stretched. Blood vessels ran to the very edge of the grayish arc. This portion of the arcus involved only the anterior corneal structures, the vessels appearing in the most superficial layers of the cornea as an extension of the limbal plexus (fig. 1).

*Krukenberg spindle.* A spindle of pigment was present upon the inner surface of each cornea, much more prominent in the right than in the left cornea. The pigment extended from pupillary border to limbus at the 6-o'clock meridian in a rather broad mildly dense dispersion. The appearance was not that of a truly characteristic Krukenberg spindle for it was somewhat atypical. The granules were more dense at the mid-portion of the spindle.

*Corneal nerves.* The corneal nerves appeared to be much more prominent than

dark adapted, a definite Tyndall's phenomenon was present, showing a slight aqueous flare with a very definite granular movement in the convection current.

Fig. 2 (Rosen). Slit beam picture shows the great depth of the anterior chamber. White substance in the anterior chamber is a high light.



*Iris.* The iris was definitely atrophic and undeveloped. Crypts were absent or little developed and there was but little pattern differentiation. Only a slight level separated the lesser from the greater circle of the iris. The color was a faded



Fig. 3 (Rosen). Shows the deep anterior chamber, the arcus senilis, the primitive iris, and the nevi in the iris.

brownish green with no startling nor pronounced iridic hue. Throughout the structure of the iris were many small pigment deposits resembling "freckles" or

nevi of the iris (fig. 3). The iris was distinctly mammalian and primitive. Under the high power of the slitlamp the iris stroma had a stellate, rather than a radiate distribution, the center of the individual stellate structure appearing slightly higher than the radiating processes (fig. 4).

*Iridodonesis.* There was a mild tremulousness of each iris which became most pronounced when the patient looked down. The deepened anterior chamber, of course, emphasized this feature, since its depth acted like a strong convex lens enlarging and intensifying the iris tremor. This iridodonesis was not like that seen in other conditions, such as iridodialysis



4

Figs. 4 and 5 (Rosen). Show the character of the iris stroma and the peculiar arrangement of the iris nodules.



5

or dislocated lens, but very much like the iridodonesis seen during an intracapsular-cataract extraction in which there is no vitreous herniation. It was slow, rhythmic, and symmetrical, involving all portions of the iris equally, like circular ripples originating from a stone thrown into the water.

*Pupil.* The pupils in average daylight appeared to measure 3.5 mm. They dilated readily to 5 mm. in the dark. There was no indication of miosis nor any tendency toward that condition. The most startling pupillary anomaly was the character of the inner "nodules" or accordionlike folds of the pupillary portion of the iris. In each eye these folds were well developed and regularly convoluted from the 9-o'clock to the 3-o'clock position in the upper half of the pupil, but in the lower half they became smaller and suddenly disappeared completely. The pupils dilated readily to an extreme degree with mydriatics. A slight eccentricity of the pupils was present, nasally and upward (figs. 4 and 5).

*Transillumination.* Upon transillumination light streaked through the iris in a radial manner; no "target reflex" was obtained. The inner circle of the iris also showed an atrophy in the lower pupillary portion of the iris, through which the light came readily.

*Tension.* There was a definite hypotension with measurement of 9 and 11 mm. Hg (Schiotz), respectively, in the right and left eyes.

*Gonioscopy.* When the patient looked down a dense pigment line could be seen running along the angle of the anterior chamber. This line was brownish black, fairly thick, and stippled. It appeared to run completely around the angle where the ciliary body becomes inserted into the sclera. The angle of the anterior chamber was extremely wide and rounded and could be observed without a contact lens.

*Lens.* Both lenses were dislocated posteriorly in symmetrical fashion, exposing the zonule for a distance of 1 to 2 mm. all around. The lens measured 11 mm. in its greatest diameter. The zonular fibers appeared to be intact all around except in the lens of the left eye at the 8- and 11-o'clock positions, where corresponding notching occurred. An occasional brown pigment granule was deposited upon the zonular fibers. The anterior shagreen of the lens of the right eye was unusually prominent. This lens showed no other abnormality. The lens sutures were not remarkable. In the lower portion of the lens of the left eye, in the oldest portion of the posterior cortex, was a crescentic area of grayish-white clouding resembling congenital lenticular detritus. Just behind these lens opacities in the anterior vitreous were several orange-red opacities fused together in a thin matting and strongly resembling "brick-dust."

*Vitreous.* The vitreous framework showed definite degenerative features. The usual silky character of the vitreous "curtain" had been replaced by a thin fibrillar substance with many small brown granular particles enmeshed in its framework. There was no gross vitreous disturbance.

*Fundus.* There was nothing abnormal about the fundi. The nerve heads, maculas, and vessels were all within normal limits.

*Visual fields.* There was a pronounced concentric contraction (see chart). The patient's dark adaptation was extremely poor.

*Color perception.* There was a complete red-green blindness.

## DISCUSSION

Anderson<sup>1</sup> has stated that "Megalocornea is a matter of a completely healthy eye in a healthy person." It is

with this concept that variance exists, and, accordingly, I have endeavored to point out the many findings which surely appear to be far removed from a "completely healthy eye."

Anderson has reviewed for purposes of differential diagnosis the subject of megalocornea in his inspiring monograph upon Hydrophthalmia. He has shown that these two names have been used interchangeably until recently, the essential differences between these two conditions being evidently unrecognized. As an example, it may be shown that Doggart,<sup>2</sup> as late as 1930, reported a case of "Buphthalmos with normal unaided vision." In this case the cornea measured 13.5 mm. and the findings of the eye examination were absolutely normal. The author emphasized the fact that there were no ruptures of Descemet's membrane, no increased intraocular pressure, normal visual fields, familial tendency, and absence of symptoms. He used the term buphthalmos synonymously with megalocornea. In Anderson's monograph a differential diagnosis has been offered which includes all the features emphasized by Doggart as being signs of megalocornea and not of buphthalmos. Anderson included under his cases of megalocornea a case reported by Law<sup>3</sup> as megalophthalmos. The patient was a man, aged 23 years, who had always had poor vision with the right eye. The globe was described as being enormous and measuring 25 diopters of myopia. The patient had a scar upon the right temple which he stated was the result of a forceps birth injury. The examiner noted a deep (good) anterior chamber and many diagonal folds in Descemet's membrane. Law reported this case as megalophthalmos, but Anderson, because of the tears in Descemet's membrane, regarded the case as one of hydrophthalmia and reviewed and referred to the case as such. It is apparent

that these folds in Descemet's membrane are those very characteristic folds found in "Forceps injury of the cornea,"<sup>4</sup> or possibly the so-called "glass membranes" in the anterior chamber following birth trauma. The folds may be present within the corneal substance and need not necessarily extend out into the space of the anterior chamber. One of Lloyd's cases of forceps injury showed a deep anterior chamber, keratoglobus, and folds in Descemet's membrane. I have seen several cases of tears in Descemet's membrane in cases with a definite history of forceps injury and have come to suspect the condition immediately if the folds run in a diagonal meridian. Recently I saw a soldier, aged 28 years, whose left eye was totally blind. He gave a definite history of forceps delivery. There was an injury with scars upon his cornea involving most of the stroma. A glaucomatous optic atrophy was present along with a myopia of over 35 diopters. This picture could be explained on the basis of trauma that caused a proliferation of endothelium seen in the folds of Descemet's membrane. Subsequently, a glass membrane may be produced by the proliferated endothelium, which covers over and predisposes to a complete glasslike covering, lining all structures of the boundaries of the anterior chamber, particularly the trabeculae and the filtration angle. Thus, the outflow of aqueous may be obstructed, producing glaucoma, as recently shown by Reese.<sup>5</sup> This glass membrane lies over the trabeculae and is continuous with Descemet's membrane over the cornea, and sometimes is continuous with a similar membrane existing upon the anterior iris surface. Reese emphasizes the point that the endothelium has the ability to produce a glass membrane in foreign soil under provocation, and forceps trauma may be all that is necessary to stimulate it. Trauma was shown to be

significant in 6 of the 26 cases reported by Reese, especially when monocularly was predominant with respect to the glaucomatous cases. Another important point in Reese's report is the frequency of occurrence of iris atrophy, which could also be dependent upon the formation of a glass membrane.

Vail<sup>6</sup> reported seven cases of anterior megalophthalmos in 1931, emphasizing the fact that the pathologic changes were not limited to the cornea alone, but the condition was an involvement of the anterior segment. The name anterior megalophthalmos was suggested for this condition, but the physical findings do not appear to support the title, for not only should there be an enlargement of the cornea, but enlargement of other structures of the anterior segment. The cornea is enlarged, but is not particularly stretched or rendered thinner. The iris and zonule, on the other hand, both give evidence not of hypertrophy, but of an endeavor to lengthen in order to "stay with" the corneal diameter. There is apparently no true miosis, but rather a small pupil for the size of the iris in which it exists. In the case herein reported, at any rate, the pupil was not miotic and dilatation was accomplished easily enough with the ordinary mydriatics. Vail describes and illustrates a "target" reflex—a manifestation of iris atrophy. A series of lighter and darker circles, one within the other, exists upon transillumination, particularly emphasized at the periphery, for within the circle of the ciliary body a dark ring is described as a dense "straight black line where the ciliary body inserts in the sclera." However, from this point inward there is no striking diaphanous differentiation of concentric circles. Vail stressed the atrophy of the iris in most of his cases, mentioning the absence of iris pigment at the pupillary border. In

many cases the margin of the pupil was referred to as being transparent as a "frog egg," but since these cases existed in old individuals it is difficult to differentiate this type of iris atrophy from that of senile iris atrophy. In only one or two cases was the slitlamp available for examination.

Although Kestenbaum,<sup>8</sup> Seefelder,<sup>9</sup> and Kayser<sup>10</sup> have provided sufficient evidence to prove that hydrophthalmos and megalocornea are not one and the same disease, it is evident that their views were not accepted until much later. Papers appearing subsequent to these publications still continued to use the terms buphthalmos and megalocornea interchangeably. The diagnostic criteria have been sufficiently and clearly described so that little difficulty should be experienced in making a differential diagnosis, for there are exact and detailed findings to be observed in all cases of megalocornea and these should be presented in all reported cases.

The biomicroscopic studies of Berliner seem to indicate that the embryotoxon in megalocornea is not a true arcus, but rather a stretching of the limbus, producing opacification of the transitional limbal zone. In the present case, at least, it appears that the arcus in the upper half of the cornea was quite different from that of the lower cornea.

Anderson in quoting Kayser states that it is important to note that Krukenberg spindle is not necessarily congenital in origin, as has been suggested, since in Kayser's case the Krukenberg spindle did not develop until this patient's 23d birthday, and then occurred two years later in his other eye. This reference would lead one to suspect that the condition of megalocornea might possibly be a progressive condition in which one of the characteristic changes is a pigmentary degeneration or dispersion.

The gonioscopic studies of Givner and Troncoso show that the angle of the anterior chamber is wide and round. The ciliary body appears to be drawn back and stretched by the receding iris, which produces the depth and roundness of the anterior chamber. A straight black line is seen where the ciliary body is inserted into the sclera. The iris appears particularly stretched at the ciliary zone. The stretching and atrophy of the zonular fibers produce the iridodonesis.

Anderson states: "If megalocornea is a form of gigantism one may ask: 'Does a peculiar form of growth of the lens or its isolation within its capsule separate it from the ties with the other ocular tissue and free it from the factors making for excessive growth?' " Again one must question such a suggestion for it has not been shown that the lens fails to increase in size. Anderson<sup>12</sup> states that iridodonesis is a frequent sign and its presence suggests a small lens. The case herein reported does anything but support such a conclusion. The lens is not "small" and there is an apparent symmetrical posterior displacement of the entire lens; in other words, the posterior chamber in such an eye is apparently much deeper than is the usual theoretic posterior chamber in which the iris rests directly upon the anterior capsule of the lens. When the pupil is dilated there is difficulty in seeing this spatial separation, but with the slit beam in the undilated pupil there is a very definite spatial gap. This phenomenon was accentuated when photography was attempted, for upon the ground glass a shadow was thrown upon the capsule of the lens as the light passed over the iris, a shadow which could not be seen nearly so well with other clinical methods of examination.

Kayser stated that in a case of megalocornea of 15- to 16-mm. diameter the proportionate lenticular size would be

11.2 by 4.5 mm. Anderson states that such large lenses have not been found by surgeons upon extraction of cataracts. Kayser's patient had a "normal sized" lens. The size of the lens in the present case, both by direct measurement and photometry, seemed to indicate an abnormal size.

It is extremely interesting to note Anderson's and Duke-Elder's comments upon the relationship of megalocornea and arachnodactyly. Anderson<sup>13</sup> states, "... This view is strengthened by the common occurrence of Megalocornea in Arachnodactyly: viz, half of 25 cases reported." Duke-Elder<sup>14</sup> states, "Its frequent association with Arachnodactyly may also be significant," and, again, "Megalocornea is sometimes a complication of Marfan's syndrome (Thaden<sup>15</sup>). These are interesting comments for in reviewing Rados's<sup>16</sup> most excellent, exhaustive, and comprehensive work on Marfan's syndrome in which every case in the literature is tabulated (over 200 cases), I have been able to find megalocornea or macrocornea in only three cases. In these three cases is included Thaden's case upon which Duke-Elder makes the assumption that megalocornea and arachnodactyly are frequently associated. Thaden's measurements of the cornea were 13 mm. and 12.5 mm., respectively. This same case had been reported one year earlier as a case of arachnodactyly and megalocornea by another author, Fleischer.<sup>17</sup> In reviewing this same list of cases of Marfan's syndrome five cases of microcornea were uncovered. It seems, therefore, that megalocornea is not a commonly associated finding in arachnodactyly, although I have seen one such case myself.<sup>18</sup>

The theoretic consideration of megalocornea has been extensively discussed. Endocrinologic, atavistic, environmental, metabolic, and hyperplastic factors have

been stressed by various sources. Vail considers the condition a hereditary hyperplasia followed by a disease process. Waardenburg,<sup>10</sup> in discussing sex chromosome characters, linkage, and "crossing over," states that the genes concerned with the size and refraction of the cornea are probably distributed over several chromosomes in man, and if this assumption is true, it may be inferred that seemingly similar clinical syndromes or signs scarcely distinguishable from each other may be due to different genes. Waardenburg lists several isolated case reports under sex-linked inheritance in

which is included megalocornea, progressive night blindness, and hypoplasia of iris stroma, associated with ectopic pupil; all of which have been encountered in the present case report. The outstanding example of sex-linked inheritance is partial color blindness, and in the present case, again, this is a prominent feature. It seems, therefore, that this single case report would support the theory advanced by Vail: namely, that megalocornea is a hereditary sex-linked condition followed by a disease process.

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# NOTES, CASES, INSTRUMENTS

## A NEW MODEL OF CONTACT GLASS FOR GONIOSCOPY (GONIOLENS)\*

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The Koeppe contact glass A and the regular gonioscopic glass C have been used by all observers of gonioscopy with good results, both from the optical standpoint and the facility of application, with the patient lying on his back. Still, they have some drawbacks which are, in particular, the weight of the glass and the fact that it fits between the edges of the

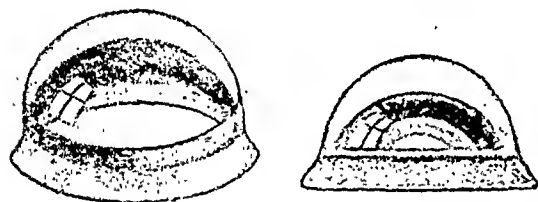


Fig. 1 (Troncoso). New contact glass for gonioscopy. Regular size. Figure 2, small size for narrow-lid apertures.

lids where nervous or difficult patients can squeeze it and push it out by the contraction of their lids. Another drawback is that patients not willing to submit to the examination try to escape by moving the eyeball up, down, or laterally under the glass. These movements may cause abrasions of the cornea due to the rubbing of the membrane against the inner edges of the contact glass. Also, lateral movements of the eye bring air bubbles under the glass, making it necessary for the observer to stop the examination and proceed to refill the cavity.

The new contact glass avoids these dif-

ficulties in part because it is applied directly over the sclera and the lids have no hold on it (fig. 1). Its inner curvature has the dimensions of an average normal cornea and is similar to those of the regular gonioscopic glass. Its upper part has a hemispherical shape and ends in a flange which holds to the sclera around the cornea. This glass gives clear images of the angle with great definition and practically no astigmatism. Its magnification is about 2X. The field of observation is a little smaller than that of the regular contact lens. However, this is not important, for the observer moves around the eye when using my new model of monocular or binocular gonioscope.

The new contact glass can be applied with the patient either sitting up or lying down. In the first case the observer uses a small suction cup which is moistened and fixed by compression upon the upper curvature of the glass. This is then turned upside down and filled with distilled water, a buffer solution, or, better still, the 1-percent solution of methylcellulose recommended by Swan.<sup>1</sup> The operator directs the patient to lower his head and to raise with his finger the upper lid as much as he can. Holding the contact glass in a horizontal position, the operator pulls the lower lid down and pushes the contact glass firmly against the cornea. With a little practice, no air bubbles will remain between the glass and the cornea. The patient's head is then raised and tilted against the wall or back of the chair for examination of the angle all around with the gonioscope.

When the patient is lying on his back, the maneuver of applying the glass is the same as for the regular lens. The glass is held between the thumb and index finger of the right hand while the

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left raises the upper lid. The glass is slid under the lid and then is pushed down upon the cornea, while pulling the lower lid down. The space over the cornea is filled by using an ordinary hypodermic syringe provided with a curved needle, similar to the one used for irrigation of the lacrimal sac. In order to remove all air bubbles the patient is directed to turn his head to the side while distilled water or Swan's methylcellulose (methocel) solution is injected with the syringe. To facilitate the injection, the flange of the glass has a small notch where the tip of the needle can be inserted. To obtain a good hold over the sclera when the glass is filled, the operator places it at the proper place over the center of the cornea and applies a slight pressure for one or two minutes until the flange stays at the scleral limbus. In this position it follows the movements of the eyeball without discomfort to the patient.

To facilitate the proper application of the glass in unruly or timid persons, the patient is directed to look with his other eye at either his own finger placed in front of that eye or a source of light. The operator may also close the lids upon the contact glass and wait a few moments till all is calm. In this instance, when the eye is opened again, the operator must cleanse the glass with a wetting agent before proceeding to the examination of the angle.

It may be objected that the Koeppe glass by keeping the lids apart makes the examination easier. However, almost all pa-

tients when they feel the strange object between their lids tend to contract the latter and to struggle. With the use of the goniolens there is no struggle, and it is easy to have the patient keep both eyes open. The eye under the goniolens can be moved without interfering with the optical image.

Removing the glass is more difficult than applying it, as it usually adheres to the sclera. The best way to remove it is to direct the patient to look inward toward his nose, and when the edge of the glass comes in view the operator inserts the tip of the needle under it, taking care that this is parallel to the surface of the sclera in order to avoid hurting the eye. The tip of the needle raises the glass a little and air penetrates beneath, making the extraction easier.

This new contact glass has been named a "Goniolens", to distinguish it from the regular glass.\* It is made of a special plastic, called "acrylic," which is light in weight and unbreakable. There are two sizes of this contact glass, the regular and a small one for narrow palpebral apertures.

Of late, I have been using a new wetting agent for cleaning the lenses, called Phemerol (Park Davis & Co.). A 1:1,000 dilution has given good results.

*630 West One Hundred Sixty-eighth Street.*

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\* The new gonioscopic lens is made by the firm of T. E. Obrig of 49 East 51st Street, New York City.

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## OCULAR SENSITIVITY TO BUTYN\*

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The use of butyn sulfate (p-amino-benzoyl-disbutylaminopropanol sulfate) as a local anesthetic is an established practice. Chemically, it is a normal sulfate of a base resembling the base of procaine hydrochloride, differing, however, in that the butyn base contains a butyl group in place of the ethyl group, as found in the procaine base, and a propanol group in place of the ethanol group.<sup>1</sup>

The Section of Ophthalmology of the American Medical Association, in February, 1922, reported that butyn sulfate could be used successfully in practically all operations on the eye. It was found that a 1-percent solution of this drug was more effective or efficient than a 1-percent solution of cocaine hydrochloride and just as effective as a 1-percent solution of phenacaine hydrochloride (holocaine). The committee report at that time stated that butyn sulfate was more powerful than cocaine in view of the fact that a smaller quantity was required for the same action because it acted more rapidly than does cocaine and that this action was prolonged and less toxic in the quantity required as compared to that of cocaine. The committee further found that butyn sulfate was superior to cocaine in that it produced no drying of the tissues and no change in the size of the pupil and that no ischemic effect was produced.

In view of these findings, this drug has had wide acceptance in various fields, including that of ophthalmology, and has been used by the writer for some time. In all this time, there has been adequate

anesthesia and no unusual reaction until a short time ago when the following observation was made:

*Case report.* E. W., aged 49 years, a white man, was sent to the Eye Clinic on May 6th, because of complaints referable to his right eye. The patient stated that he saw a halo around lights and that some generalized pain in the eyeball itself was almost continually present, especially in the evenings. He was seen in the Eye, Ear, Nose and Throat Clinic at 3:00 p.m. The results of a routine examination were as follows: There was no exophthalmos, no enophthalmos, no lagophthalmos, nor ptosis. The lid borders were normal in appearance. The palpebral and bulbar conjunctiva showed a normal amount of injection. The caruncle was normal in appearance and position. The lacrimal apparatus showed no abnormalities. The cornea was entirely negative for opacities, being clear in its entirety. The anterior chamber was normal in depth, and the iris showed the same bluish pigmentation bilaterally, no abnormalities being observable. The pupils were equal in size, round, and reacted readily to light and accommodation. The media were clear. There was mild physiologic cupping of the discs. A small scleral crescent along the temporal margin of both discs was noted, and the vessels showed increased tortuosity. Manifest vision was: O.D. 20/20-1; O.S. 20/40+2. Retinoscopic (manifest) O.D. +0.50D. sph.  $\approx$  +0.25D. cyl. ax. 55°; O.S. +0.25D. sph.  $\approx$  +0.37D. cyl. ax. 65°, which could be corrected to 20/20. The patient read J4 with this correction. With +1.50D. sph. added, he read J1. Ocular muscle coordination was normal.

The patient had not used any medication, nor bathed his eyes, nor washed his face since early morning. Due to the complaint of halo around lights and generalized pain in the eyeballs proper, a tonome-

\* Published with permission of the Medical Director, Veterans Administration, who assumed no responsibility for the opinions expressed or conclusions drawn by the author.

ter reading was indicated. Therefore, a few drops of 2-percent butyn sulfate were instilled in each eye and approximately 15 minutes later the tonometer reading was made: 17 mm. Hg (Schiotz). The patient was dismissed at 3:30 p.m. and returned to the ward.

According to his statement, at about 4:15 to 4:30 p.m., his eyes began to feel itchy. He did not complain of this, had his evening meal, and returned to the ward. At approximately 6:00 to 6:30 p.m., the patient stated that his eyes began to water excessively and he could not look at the light, as it seemed to bother him. That evening it was noted by the ward attendants and the nurse that the patient had some slight swelling of the eyes. The O.D. was called and cold compresses were prescribed. The next morning he was immediately seen by the ophthalmologist and at that time the following changes were present:

There was a bilateral marked edema of both the upper and lower lids. A marked blepharospasm with photophobia was noted when light approached the eyes, as by the ophthalmoscope and indirect illumination. The palpebral apertures were extremely small and there was excessive lacrimation. The bulbar and palpebral conjunctiva showed marked injection. There was no involvement of the cornea, and the interior of the eye appeared normal.

The conjunctival sacs were irrigated with boric solution containing 1 to 1,000 adrenalin, and tepid compresses were prescribed. At the same time a Patch test with butyn sulfate was made in view of the fact that this occurrence seemed to have its onset subsequent to the instillation of this drug into the eyes, as described. A few hours later, the patient stated that there was some relief as the result of this treatment. The irrigations were continued at intervals of four hours dur-

ing the day, and the edema gradually subsided. The patient stated that all during the previous night he had felt as though there was sand in his eyes. It seemed as though he could feel his eye "blooming out." With this therapy, the condition subsided rapidly and on the third morning the eye appeared almost normal. There was no rise in tension at any time and, in general, no other undue symptoms were noted. The Patch test was extremely positive for butyn sulfate within the 48-hour period.

### DISCUSSION

This case is reported because of the subsequent reaction which occurred following instillation of butyn sulfate for local ocular anesthesia. In Lundy's<sup>2</sup> article on local anesthesia it is stated that butyn sulfate is a good surface anesthesia in 2-percent solution, and that, further, "in the use of butyn one should be on guard for idiosyncrasy, since occasions have developed when it seems that the patient was hypersensitive to butyn." The literature revealed, however, only the following four cases of butyn sensitivity: In 1927, Lemoine,<sup>3</sup> of Kansas City, Missouri, and Newton,<sup>4</sup> of Dallas, Texas, each reported a case of conjunctivitis and dermatitis due to butyn sulfate, each confirmed by skin test. In May, 1933, Ralston and Payne<sup>5</sup> reported a case of local anesthetic with lid edema as the dominant symptom. In 1939, Parkhurst and Lukens<sup>6</sup> reported a case which started as a sty in the upper lid; 2-percent butyn was used as a local anesthetic, and then edema and vesiculation occurred due to the drug. Further confirmation that only four such cases have been reported thus far was received in a personal communication from Dr. J. F. Biehn.

\* The case is of interest not only from that angle, but because of a chronologic sequence of symptoms after the use of

butyn. It is shown that primarily the patient felt a local irritation with subsequent lachrimation, photophobia, and marked blepharospasm. Edema developed early and was at its peak when the patient was seen the following morning, as was also the conjunctivitis. From a treatment standpoint, it is believed that moist tepid compresses and irrigations of boric-acid solution containing drops of 1:1,000 adrenalin solution do hasten the recovery from this condition.

Since this case was observed, the writer has had occasion to use neosynephrin, 10-percent ophthalmic, for patients showing edema of the lids such as one sees in cases of angioneurotic edema and edema associated with hordeolum and other lid infections. It has been used after a local anesthesia had been applied topically to the area, then a few drops of neosynephrin have been placed on the lid, and the finger was used to spread gently and massage the medication over the lid. In almost all cases in which this medication has been used, there has been a rapid and

almost complete reduction of the edema within a 15 to 30-minute period. This medication is also used as a powerful miotic in iritis and associated infections where there are adhesions, but it is believed that it also has its use in local edema of the lids.

### CONCLUSION

1. A case of ocular sensitivity to 2-percent butyn-sulfate solution is reported when used as a local anesthetic in the eye, as manifested by conjunctivitis and edema of the lids.

2. It is not a common occurrence, for only four other cases have been reported in the literature since the use of this drug began.

3. Recovery was uneventful after the application of moist tepid compresses and irrigations of boric-acid solution containing drops of 1:1,000 adrenalin solution. Neosynephrin, 10-percent ophthalmic, can also be used for chemosis of the lids.

*Veterans Administration.*

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# SOCIETY PROCEEDINGS

EDITED BY DONALD J. LYLE

## ROYAL SOCIETY OF MEDICINE

### SECTION OF OPHTHALMOLOGY

October 13, 1944

MR. P. E. H. ADAMS, *president*

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#### NOTES ON GLAUCOMA

MR. P. E. H. ADAMS gave the President's Address on this subject. He said that in the course of over 40 years of private and hospital work he had come across a great variety of types of this disease.

It is difficult to decide when the disease really starts. He had seen several cases in which one had had suspicions of the discs and kept these eyes under observation. After 15 years the tension became elevated and Bjerrum's scotoma began and the discs looked more pathologic. He quoted one case which was typical in each class.

#### HINGE-FLAP SCLEROTOMY DRAINAGE OPERATIONS

SIR RICHARD CRUISE showed three cases as typical results of his method for the relief of elevated tension in the hope that they would interest members who were not entirely satisfied with their results in other operations for chronic glaucoma.

The principle he aimed at was to establish a permanent filtrating cicatrix without excision of any tissue.

To attain this the incisions were deliberately prevented from normal healing by

connective tissue, to enable the endothelial cells lining the anterior chamber to proliferate into and round the margins of the incisions, so that when healing did take place the cicatrix was formed of endothelial and connective-tissue cells. The margins of the hinged flap were prevented from sealing down by massaging the aqueous out of the anterior chamber underneath the conjunctival flap, thereby causing the corneoscleral hinge flap to ride up under the conjunctival bulge. It was essential to do the first dressing and manipulation 18 to 20 hours after the operation, otherwise the incisions might be firmly healed.

He had been practicing this method, with modifications of technique, for 25 years, and the results were extremely satisfactory. There was minimal damage to ocular tissue, and complications were negligible. Cataract, iritis, hemorrhage, delayed formation of anterior chamber, and late infection did not occur.

Last year, for the first time, after 25 years of experience of the operation in private and in hospital cases, an eye had been obtained *post mortem* for examination, and his colleague, Mr. E. Wolff, with some very good sections, had substantiated by histologic proof the correctness of his previously published presuppositions.

*Discussion.* Mr. Williamson-Noble asked whether the patients were put on pilocarpine after the operation.

Sir Richard Cruise said that with confidence atropine was instilled for the first week to insure as far as possible that all filtration of aqueous should take place through the incisions and not through the normal channels.

Mr. Eugene Wolff said that an effort

had been made for some 12 years to obtain a section of an eye operated on by this sclerotomy method. There was never occasion to remove one of these eyes from the living patient. Eventually a patient who had been operated on some years before died, and the eye was obtained and sent to the laboratory. There could be no doubt that the track was lined with endothelium. It was usually stated that following an operation no such lining took place, but in this case the lining was obvious.

#### FAMILIAL CORNEAL DYSTROPHY—THREE CASES

MRS. V. M. ATTENBOROUGH said that she saw three sisters in this family for the first time in 1943. These cases, she thought, belonged to the group which was classified as granular corneal dystrophy, a dominant disease affecting both males and females. The opacities, which were always bilateral, occurred as discs or rings situated beneath the epithelium in the axial region of the cornea.

The eldest was 24 years old, with onset at about 18 years. The vision in each eye was 6/9. The second patient was 20 years old; onset at 13. The vision in each eye was 6/24. The youngest was 14 years old; onset at 11. The vision was 6/24 in each eye. The rings were present in all three cases, but were most marked in the second of the three patients. She thought that the fact that the onset in the eldest girl had not been noticed until she was 18 was probably due to the fact that her vision was better. The opacities for the most part lay beneath the corneal epithelium and Bowman's membrane, but some also lay deeper in the corneal substance. The father, grandmother, and great grandmother were known to have been affected.

#### RETINAL DETACHMENT WITH ELEVATED TENSION

MR. H. G. W. HOARE, by courtesy of Mr. Stewart Macky, presented a man, aged 42 years, apparently in good health. Fourteen years previously, while sawing wood, a three-inch cube flew up and struck him in the right eye. The vision was hazy for three days, but there was no bleeding from the eye, nor was there a black eye. He was attended by the factory nurse but did not seek medical advice. Three months later he noticed waviness in the vision of the right eye, first observed while at rest after his day's work. He consulted an oculist who prescribed glasses. The sight of the right eye gradually deteriorated, the central vision being lost before the peripheral vision. He was quite blind after two years; that was over 12 years ago. He had never had pain in the eye, nor had he had any trouble with the other eye. Six weeks ago he underwent a medical examination for the Army and was asked to seek a specialist's opinion.

The vision at that time was L.E. 6/6, with correction; R.E. inability to see light. The pupil of the right eye was inactive to light, but reacted briskly consensually. The tension was ++. There were slight posterior cortical lens changes, otherwise the media were clear. There was a complete shallow retinal detachment which was not wavy, no hole was seen and no new growth. The disc was markedly cupped.

#### HEMORRHAGIC COATS'S DISEASE

MR. H. J. B. GOLDSMITH presented a 10-year-old boy. It was noticed that the vision of the right eye was defective in November, 1943. There was nothing in the family history nor in the personal history except an attack of whooping

cough in March, 1943. Nothing abnormal was found in the general physical examination. A skiagraph of the chest showed increased hilar striation, thought to be a legacy of the attack of whooping cough in 1943. The Wassermann reaction and Kahn and Mantoux tests were all negative, and the blood count was normal. In the right eye there was a total retinal detachment, and the surface of the retina was covered with glistening bodies, probably cholesterol crystals. In the lower temporal quadrant there was a massive retinal exudate on the surface of which there were multiple punctate and diffuse hemorrhages. The vessels in this region showed many varicosities. The case seemed to be an example of the first group into which Duke-Elder classified Coats's disease.

*Discussion.* Mr. R. A. Greeves agreed with the diagnosis. The varicosities were commonly seen and were characteristic of Coats's disease. He did not therefore agree with the suggestion of another speaker that the condition might be due to whooping cough.

Mr. Goldsmith, in reply to questions, said that the patient had been under observation for only a fortnight, but that the whooping cough was in March, 1943, and the defective vision was not noticed until November, 1943, although it might have existed before that.

#### LOOSE FLOCCULUS IN ANTERIOR CHAMBER

Mr. VICTOR PURVIS presented a man, aged 20 years, who had noticed a loose-floating black spot in his right eye. He was found to have a loose spherical piece of material in the anterior chamber of the right eye, about 1 mm. in diameter, which could be displaced in the anterior chamber to any point desired. It was seen on the back of the cornea when his head was forward; if he held his head

back, the piece of pigment floated on to the iris or lens. The iris and pupil were normal, but this piece of material looked like a ball of pigment under slitlamp examination, and could only be assumed to be a congenital abnormality. It did not interfere with vision in any way, and the patient felt no pain, but it was now causing some functional worry. Mr. Purvis had not heard of nor seen any similar case where the pupillary margin was normal.

*Discussion.* Mr. C. B. Goulden said that he had seen a number of these cases. They were cysts of the pupillary marginal pigment.

Mr. Frank Law endorsed this opinion. He recalled a case, seen a few years ago, which he had examined under the slit-lamp and had come to the conclusion that it was cystic.

#### GLASS IN ANTERIOR CHAMBER

Mr. VICTOR PURVIS presented a woman, aged 54 years, who had a piece of glass in the anterior chamber. An attempt had been made to remove it and the question was whether another attempt should be made. Under the capsule of the lens, a movement of soft lens matter was visible under the slitlamp. One assumed that the soft lens matter was mobile and that the case was becoming morgagnian. Mr. Purvis could not remember having seen such mobility before.

*Discussion.* Mr. W. E. Heath, who was associated with Mr. Purvis in this case, was asked what was the technical difficulty in removing the piece of glass. He said that the glass was lying in the angle of the anterior chamber at about the 6-o'clock position. He inserted a keratome into the angle of the anterior chamber and hoped to remove it, but there was a certain amount of wedging between the lens and the cornea, and he was un-



able to make the extraction. He then tried to do an iridectomy, but the glass prevented him from getting an effective hold of the iris. Asked how long the glass had been in the eye, he replied that the time which elapsed between the case coming in and the attempted operation was 10 days.

Mr. Frank Juler referred to a case in which he had removed a splinter of glass which was free in the anterior chamber. He had made an incision as for Saemisch's section, with the patient facing and looking downward; the ensuing aqueous drip carried the splinter into the section, where it was easily picked out after the patient had resumed the usual position on his back. In a similar case recently he had improved upon the technique by making a puncture with a broad needle in the usual position; the patient was then turned over so that he looked downward; a touch on the cornea released the aqueous, and the foreign body was recovered from the lower fornix. In this case the minute body was of a nonmagnetic metal.

Dr. John Marshall suggested that in a case of nonmagnetic foreign body in the eye a corneal section downward, such as Dr. Traquair employed in his intracapsular extractions, gave a good approach to the angle of the anterior chamber. A stitch was placed in the conjunctival flap and the cornea turned upward so that the major portion of the iris was exposed, and the foreign body could be extracted by blunt forceps with ease.

#### PERSISTENT PUPILLARY MEMBRANE

Mr. VICTOR PURVIS presented a gross case of persistent pupillary membrane with strands coming forward and attaching themselves to the back of the cornea.

#### MASSIVE EXUDATIVE RETINOPATHY

Mr. VICTOR PURVIS presented two contrasting cases of exudative retinopathy, one in a woman, aged 43 years, and the other in a woman, aged 69 years, which is the more usual age for such cases. The right eye in the second case gave a clue to the cause, showing an early central degeneration. The left eye showed an extraordinary mass which looked at first like a neoplasm and, in fact, had been so diagnosed, but the picture taken as a whole, with the hemorrhages, confirmed the diagnosis of exudative retinopathy.

The first case showed a central white mass under each retina. This patient was otherwise perfectly healthy.

#### CHICAGO OPHTHALMOLOGICAL SOCIETY

December 11, 1944

Dr. SAMUEL J. MEYER, *president*

#### CHOICE OF THE FIXATING EYE

Dr. JAMES W. WHITE presented a paper on this subject.

#### CLINICAL MEETING

(Presented by The Illinois Eye and Ear Infirmary)

#### HEREDITARY ANTERIOR MEGALOPHTHALMOS

Dr. DAVID HORWITZ presented a man who complained of failing vision of two years' duration. He said that in 1915 his vision was 20/30 in each eye; that since birth he had had "enlarged pupils." There was no history of a similar condition in the family.

Right Eye. The vision was 6/200. The cornea was of normal thickness, but markedly enlarged (horizontally 13.5 mm., vertically 13 mm.). Marked arcus

senilis was present. The pupil was 3 mm. in diameter and reacted sluggishly to light; under neosynephrin it dilated to 5 mm. The anterior chamber was very deep and optically empty. The iris, which was grayish blue in color, showed marked atrophy of the stroma, with the posterior pigment layer shining through. Marked iridodonesis was present. The lens was tremulous, appeared to be of normal size, and was subluxated backward above. It showed advanced cortical and nuclear cataractous changes. There was a good red reflex without fundus details.

**Left Eye.** The vision was 20/200. The cornea and anterior chamber had the same appearance as in the right eye. The pupil was 8 mm. in size and did not react. The iris showed extreme atrophy and a moderate degree of iridodonesis. The lens was tremulous, subluxated downward and backward; it had a moderately advanced posterior saucer-shaped cataract with superimposed nuclear changes. A line of pigment was deposited superiorly in the recessus hyaloideo-capsulare. The vitreous showed a moderate number of opacities; the disc was normal.

Gonioscopy showed abnormally wide angles in both eyes, with very heavy trabecular pigmentation. In the depth of the angle the ciliary body was covered by uveal meshwork, which also lined the root of the iris. Intraocular pressure was R.E. 13 mm., L.E. 9 mm. Hg (Schiotz). Ocular rigidity was low. A cataract extraction on the right eye will be performed in the near future.

The term hereditary anterior megalophthalmos was suggested by Vail in 1931. He annotated 69 cases, in 27 of which lens opacities developed. Cataract operations were performed successfully in 12 out of 18 cases; in 11 of these the lens was delivered on the spoon or needle. To these can be added another case re-

ported by Dr. Hugh C. Donahue (*Amer. Jour. Ophth.*, Sept., 1944) in which successful bilateral cataract extractions were carried out.

#### MIKULICZ'S DISEASE

DR. JAMES WALSH said that this woman, aged 59 years, complained of a chronic sensation of irritation in both eyes. She had noted gradual development of symmetrical swellings in the upper eyelids, and in the parotid and submaxillary regions during the past year. She thought she was in perfect health and had lost no weight.

There was fairly hard, indolent enlargement of the lacrimal, parotid, submaxillary, superficial cervical, axillary, and inguinal glands. Liver and spleen were of normal size, and no masses could be felt in the abdomen. The cytologic condition of the circulating blood was normal, and sternal puncture showed a somewhat hyperplastic marrow. Histologic study was made of a piece of the left submaxillary gland and of a lymph node. In the sections of the salivary gland, some of the glandular tissue had been replaced by wide irregular areas made up of a hyalinized substance, the staining qualities of which were not quite those of collagen nor of amyloid. Scattered within this material were cellular infiltrations of round cells, monocytes, and cells resembling the Sternberg-Reed type. The sections of the lymph node were overrun by cells of the lymphocytic type. The histologic diagnosis was lymphoblastoma. Under X-ray therapy the glandular swellings receded.

#### MALIGNANT CARDIOVASCULAR HYPERTENSIVE DISEASE

DR. THEODORE C. ZEMAN said that a 19-year-old boy was seen in the clinic on November 24, 1944. He complained

of blurred vision associated with headache. This condition had begun only 10 days previously and had advanced so rapidly that he was almost unable to get around by himself. He said he had been in excellent health until the onset of visual symptoms.

On examination he appeared somewhat ill and had to be assisted to a chair. Vision had become so poor that he could only count fingers at one foot with the right eye and at six feet with the left eye. The fundi revealed marked arterial constriction with retinal edema. The veins were engorged, and the entire posterior pole was covered with cotton-wool patches. A few flame-shaped hemorrhages were visible. There was beginning blurring of the nasal margins of both discs.

His blood pressure was 200/150. Urinalysis showed 3+ albumen, red and white blood cells, and granular casts.

The following day the patient complained of mild dyspnea associated with nausea. The heart rate was 84, rhythm regular, the borders were within normal limits and no murmurs were heard. On auscultation, fine crepitant rales were heard over both bases. On the second day after admission, the dyspnea became very marked and the sputum somewhat rusty, and the patient appeared acutely ill. The rales over both bases were more marked and some dullness was elicited on percussion. It was obvious that he was undergoing acute cardiac decompensation, and he was transferred to Cook County Hospital. Venesection was performed and the patient died the following day. Autopsy was not permitted.

This young patient had a fulminating type of malignant hypertensive cardiovascular disease, the first subjective sign of illness being failure of vision. He died of cardiac failure three weeks after the onset of these symptoms.

## DETACHMENT OF RETINA

DR. STANLEY SWIONTKOWSKI presented a man, aged 37 years, who stated that on September 1, 1943, he became conscious of "gold rings" in front of the left eye followed by a curtain rising from below. Central vision, which previously had been excellent, was markedly reduced. When seen two months later the vision was R.E. 20/20; L.E. ability to count fingers at 2 feet. An almost complete retinal detachment with numerous folds was found. The macular area was obviously detached; no tears were seen.

The patient was put to bed, given pinhole glasses, and the retina flattened gradually. Five weeks later two tears were found located 1 disc diameter anterior to the equator at the 10:30-o'clock position. These linear tears had been hidden between two retinal folds. One week later operation was performed, using the 0.5 mm. Kronfeld needle, followed by several drainage punctures. The postoperative course was uneventful, and the patient was discharged three weeks later.

When he was last examined the retina was attached. Corrected vision in the left eye was 20/20-2. Peripheral and central fields of vision were normal. There was a definite change in pigment distribution about the macula. The only complaints were those of micropsia and metamorphopsia.

This case presented the interesting feature of an almost complete return of function of the macula, although it had been detached for at least eight weeks.

## MALIGNANT MELANOMA OF THE CHOROID

DR. BENJAMIN LYONS said that this patient, a Negress, aged 28 years, noticed diminished vision in the left eye two weeks prior to admission. The external findings were normal in both eyes. The

tension was normal. The vision was R.E. 20/20, L.E. 20/200. In the left eye the infero-nasal quadrant of the retina appeared raised in the form of a semi-spherical solid hump which sloped more gradually toward the ora serrata than on the other three sides. Over the posterior portion of the hump the retina was completely opaque, whereas through its anterior portion a grayish-brown mass was visible directly underneath the retina. Transillumination of the latter portion showed a distinct shadow. The inferior retina adjacent to the hump was shallowly detached. The clinical picture was thought to be characteristic of a malignant melanoma of the choroid.

#### SPHENOIDAL-RIDGE MENINGIOMA EN PLAQUE

DR. PAUL LAMBRECHT presented a man, aged 52 years, who complained of progressive painless proptosis of the right eye and mild tearing. Three years ago he had received a blow over the right eye sufficiently forceful to stun him. No immediate ill effects were noted. About a year ago he consulted his family doctor about a slight prominence of the right eye and was referred to an eye specialist.

There was an irreducible exophthalmos of the right eye, which was 10 mm. anterior to the left eye as measured by the exophthalmometer. A firm, smooth, nontender mass was located in the right temporal region, measuring 3 by 5 cm. and definitely elevated. The overlying skin was freely movable. There was no palpable pulsation nor audible bruit.

The vision in each eye was 20/20 uncorrected. External ocular movements were normal in all directions. Peripheral and central visual fields were normal. Postero-anterior and lateral X-ray films of the skull showed marked density and thickening of the right sphenoidal ridge

and of the roof and lateral wall of the orbit and middle fossa.

The case was presented as the typical picture of a sphenoidal-ridge meningioma en plaque.

#### TUBERCULOUS KERATITIS

DR. HENRY RICCI presented a woman, aged 48 years, who was seen for the first time in April, 1942. She complained of blurred vision of the left eye, photophobia, redness, and foreign-body sensation of two weeks' duration. The vision was R.E. 20/20, L.E. 20/200. The cornea of the left eye showed a round, gray infiltration about 3 mm. in diameter, located deep in the center of the cornea. General medical examination and laboratory tests including Mantoux test were negative. The patient was put on a regime of heat, atropine, and typhoid vaccine. There was an almost complete recovery in six months. The vision returned to 20/70.

The eye remained quiet until September, 1944, when the symptoms recurred with more severe pain. There was a deep central keratitis extending to about 1 mm. from the corneo-scleral margin nasally and 3 mm. from the margin in all other meridians. Descemet's membrane showed marked folding. There was a slight secondary iritis. The vision of the left eye was perception of hand motion at 2 feet. The tuberculin test made with 1:100,000 dilution of protein purified derivative was negative, but the 1:10,000 test showed 4+ reaction. A chest plate was normal as were temperature curves. General physical examination was non-contributory.

The eye remained irritated, and the lesion became more densely infiltrated with an abundance of deep and superficial vascularization. Two months after onset, the vessels had penetrated to the center of

the infiltration. In the following few days the center of the infiltration sloughed off, leaving a small descemetocoele, about 2 mm. in diameter, just nasally to the center of the cornea. The following day the first of three weekly X-ray treatments, consisting of 60 roentgen units, was given. The descemetocoele covered over rapidly and three weeks later the eye was almost pale. The corneal lesion continued to regress, leaving a dense central leukoma.

This was a case of deep keratitis of probably tuberculous etiology. It presented the typical chronic, recurring course of deeply infiltrating, partly necrotizing lesion without any demonstrable focus of infection elsewhere. The part played by the X ray in the healing process was purely hypothetical.

#### ATYPICAL COLOBOMA OF THE CHOROID

DR. ALBERT A. BARAFF said that a nine-year-old boy came to the clinic without any specific complaints regarding his eyes. The vision was 20/20 in each eye without correction. The fundus of the right eye showed a coloboma of the choroid, nasally and below. The defect was contiguous to the optic disc, which was markedly elongated obliquely at a 45-degree axis. The edges of the coloboma were sharply margined and pigmented. The floor was considerably depressed below the level of the rest of the fundus. The inferior nasal retinal vessels were seen crossing over the coloboma without any marked dipping at the edges of the coloboma. Its floor was covered by a layer of large choroidal vessels.

The coloboma was of the bridge type, an isthmus of relatively normal fundus separating a large central defect from a smaller peripheral one. The latter did not extend to the visible periphery.

The vision of 20/20 was not incompatible with the extensiveness of the

lesion. Central vision is not generally affected when a coloboma is inclined nasally. The central field showed a scotoma, which was consistent with the clinical picture.

#### FUCHS'S CORNEAL DYSTROPHY COMPLICATED BY SENILE CATARACT

DR. VALENTIN RAMIREZ presented a Negro, aged 49 years, who had been under observation for almost three years. He complained of gradual diminution of vision and short episodes of redness and irritation of both eyes.

The classical picture of a bullous epithelial dystrophy was seen, associated with a marked cornea guttata. Senile lens opacities had been developing slowly. Visual acuity was 20/200 in each eye. A contact lens improved vision to 20/70+. Since rapid progression and exacerbation of the corneal disease had been reported after cataract operations in such cases, it was decided to temporize by prescribing contact lenses.

#### LUETIC TARSITIS

DR. JOSEPH S. HAAS said that a man, 54 years old, was seen for the first time on November 30, 1943. He complained of a red, painful left eye which had troubled him for two weeks. The condition began as a small pimple on the lower lid margin which increased in size and then broke down to discharge a thick yellowish secretion. There was a history of blunt injury to the eye three years previously and a syphilitic infection at the age of 24 years.

The upper and lower lids were reddish-purple in color. There was diffuse edema and induration, most marked over the tarsi. About 3 mm. temporal to the inner commissure, a dirty necrotic ulcer about 3 by 3 mm. in size, with a firm, indurated base, was located in the lower lid. From this ulcer exuded the thick discharge. The

regional glands were not involved. Cultures of the discharge showed hemolytic *Staphylococcus albus*. Repeated blood Wassermann tests and dark-field examinations were negative. Consultations with the departments of dermatology and otolaryngology were noncontributory.

A biopsy specimen was taken from the floor of the ulcer, approaching it from below, the pathologic report on which stated there was round-cell infiltration with perivascular infiltration and a large amount of inflammatory hyperplasia. Following the biopsy examination the ulcer granulated in from the bottom, but the swelling over both lids persisted and a localized indurated area developed in the upper lid.

All conventional forms of treatment were ineffective, including sulfonamides administered locally and internally over long periods; potassium iodide; X-ray therapy; local penicillin medication. The patient was seen at intervals of about a month, but there was practically no change in the condition of the lids. At each visit a routine blood Wassermann test was made, and in November, 1944, one year after the patient's first visit, a positive blood test was obtained; this was confirmed by two subsequent positive tests. He was put on a rapid course of arsenic therapy and one month later there was practically complete subsidence of the ocular condition.

This was a striking example of luetic tarsitis with ulceration, substantiated by the history of initial infection, the pathologic changes, absence of regional glandular involvement, refractoriness to ordinary treatment, and prompt subsidence when the patient was placed on anti-syphilitic therapy.

#### DETACHMENT OF RETINA WITH MULTIPLE TEARS

DR. PETER C. KRONFELD presented a Negress, aged 32 years, six months following a successful operation for a retinal detachment characterized by multiple tears. At the time of her first visit (March, 1944) examination of the left eye revealed a flaccid, freely movable detachment of the lower half and of portions of the upper temporal quadrant of the retina. The corrected central vision was 20/40. In the equatorial region below, 27 through-and-through tears of not less than one p.d. individual size were counted. These were bunched together in a relatively small area, with narrow bridges of retinal tissue between them. The visual-field findings corresponded to the ophthalmoscopic. The operation (May, 1944) consisted of a double arc-shaped barrage laid posteriorly to the cluster of tears, with radial reinforcements. The cauterizations were made with a needle, 0.2 mm. thick and 0.5 mm. long. A trephine opening was made in the vertical meridian below. The postoperative course was uneventful.

The retina was found to have become reattached on the seventh postoperative day and has remained in that position to date. The visual field was almost full, the corrected vision 20/30. In the patient's other eye, which was operated on in 1937 for the same condition in another institution, the retina was partially detached and the vision was 2/200. Multiple tears of average size, as long as they are located within one or two adjoining quadrants, do not necessarily give a poor prognosis.

Robert Von der Heydt.

# MEMPHIS SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

December 12, 1944

DR. J. WESLEY MCKINNEY, *presiding*

## THROMBOSIS OF RETINAL VEIN TREATED WITH DICUMAROL

DR. ROLAND H. MYERS said that E. J. J., a Negro, aged 71 years, came to his office on November 27, 1944, stating that for two weeks his distance vision had been cloudy and print blurred when reading. The right eye was blind due to injury in childhood and chronic glaucoma. The vision in the left eye was 20/80, improved with +.75D. sph. to 20/60; with a +3.00D. sph. added he read J5. Mydriatics had very little effect in dilating the pupil. The tension was R.E. 67 mm., L.E. 24 mm. Hg (Schiotz). Ophthalmoscopic examination of the right eye was unsatisfactory because of leucoma of the cornea. In the left eye the descending retinal vein was seen to be full and tortuous as it left the optic nerve and at some places buried in the retinal tissue. There was edema of the retina and macular region. There were scattered hemorrhages over the corresponding retinal area supplied by the descending retinal vein.

The prothrombin time was determined and dicumarol therapy was started on November 29, 1944. Initial dose was 300 mg. or 3 capsules. Forty-eight hours after the initial dose, the prothrombin time was again determined. The prothrombin time had not been changed, so 200 mg. was then given. Twenty-four hours later the prothrombin time started decreasing and this brought his prothrombin activity to 37 percent of normal. The vision on December 12, 1944, with +1.50D. sph. was 20/30; with +3.00D. sph. added he was able to read J1. The prothrombin activity has to be determined each day, for this is

the only method by which the dosage of dicumarol can be estimated, because the drug has a cumulative action. The patient's prothrombin time should be decreased to 15 to 30 percent of normal prothrombin activity. Below 15 percent there is danger of hematuria and bleeding from mucous membranes that can be controlled only by transfusions and vitamin K.

The edema of the retina had decreased, retinal vessels were more prominent, and hemorrhages were becoming absorbed. The patient was still under treatment.

The factors in favor of this drug were that it was economical for the patient, and that it could be taken by mouth in the form of capsules.

## OPERATIONS FOR EXCESSIVE LACRIMATION

DR. WESLEY MCKINNEY reported that Mrs. D. D., aged 51 years, was seen for the first time on December 26, 1940. Nine months previously she had had a severe infection in the region of the right tear sac. The exact nature of the infection could not be determined, but since that time there had been profuse lacrimation and mucopurulent discharge. Both the upper and lower canaliculi were obstructed near the entrance into the tear sac.

At operation extensive scarring was encountered about the tear sac and canaliculus. Much of the scarring was resected and a silver probe was put into the lower canaliculus and carried into the sac by means of an opening made in its lateral wall. The silver probe was left in place for seven weeks and during this time fluid passed easily through the lower canaliculus. However, it again became obstructed. The patient then received five deep X-ray treatments of about 120r over the lacrimal gland. The lacrimation was not affected by this therapy. Eight

months later a conjunctivodacryocystotomy was performed. The tear sac was freed, and the dome of its cupula was excised. The opening into the tear sac thus made was sutured to an opening made in the lower cul-de-sac, immediately beneath the punctum. This opening closed very promptly despite efforts to keep it open. Later a subconjunctival resection of the lacrimal ductules was performed. All the lacrimal ductules were resected, including the large one behind the external canthus. No appreciable effect was made on the lacrimation.

In view of the fact that the lacrimation was disfiguring as well as uncomfortable, it was decided to remove the lacrimal gland despite the possibility of producing keratitis sicca. At dacryoadenectomy, the accessory lacrimal gland was exposed but not removed.

At the time of last examination there was no lacrimation during most of the time, although the eye looked a little watery. There was still a little lacrimation on windy or cold days.

Pathologic report of the lacrimal gland showed a slight infiltration of small round cells in the connective tissue of the gland. Whether this low-grade inflammatory reaction was the primary cause of the excessive lacrimation or whether it was the result of the X-ray therapy could not be determined.

#### PLASTIC REPAIR FOR CICATRICIAL STENOSIS OF THE LACRIMAL CANALICULI

DR. J. WESLEY MCKINNEY reported the case of Mrs. L. C. B., aged 61 years. The history was that the right tear duct had been blocked for about 40 years, but the patient had not been troubled with excessive lacrimation until a few years ago. On examination it was found that both the upper and lower canaliculi were blocked before the entrance into the tear sac.

The patient was operated on on November 29, 1944. The right lower canaliculus was exposed together with a very small and almost tubular tear sac. A lateral incision was made into the tear sac and an obstruction at the neck or entrance into the nasolacrimal duct was found. This obstruction was passed rather easily and dilated with a Ziegler probe. There was much scarring about the lower canaliculus and between the end of the canaliculus and tear sac. The nasal end of the canaliculus was opened and a 2-mm. rubber tube bearing a sleeve of mucous membrane taken from the lip was inserted into the canaliculus and brought out through the dilated punctum. The other end of the tube bearing the graft was inserted into the tear sac and carried into the nasolacrimal duct. The tube was sutured at several places to the upper lid to stabilize its position. The tube was removed on December 11th, and there was a very good opening into the tear sac.

A follow-up report will be made later.

#### X-RAY CATARACT

DR. J. WESLEY MCKINNEY reported the case of Mr. R. B., aged 41 years, who was first seen in 1937. He had a carcinoma of the limbus of the right eye. At that time he was given 2,700r of X ray during a 14-week period. The tumor disappeared entirely and has, to date, shown no recurrence. At a recent examination, the best vision obtainable was 20/30. This diminution of vision resulted from anterior and posterior subcapsular opacities in the lens. There were also fine opacities along the lens sutures. A few vacuoles were seen. The fundi were normal. The lens opacities were interpreted to be the result of the X-ray therapy.

#### SUBCONJUNCTIVAL RESECTION OF THE LACRIMAL DUCTULES

DR. J. WESLEY MCKINNEY reported



the case of J. S., aged 61 years, who was seen in November, 1939. He complained of excessive lacrimation of both eyes for 10 years. There was no conjunctivitis, the puncta were in good position, and the fluid passed into the nose readily through both the upper and lower canaliculi on both sides. There was nothing about the head, neck, or body which could be found to produce excessive reflex stimuli to the lacrimal glands. Subconjunctival resection of the lacrimal ductules was performed on both eyes. After healing was complete there was no alteration whatever in the amount of lacrimation.

#### FUSION IN ESOTROPIA WITHOUT ORTHOPTIC TRAINING

DR. PHILIP M. LEWIS presented Miss E. M., aged 25 years, who was examined for the first time in 1931. At that time she had an esotropia of her right eye of 26 prism diopters. The vision was R.E. 20/100, L.E. 20/25. Cycloplegic refraction was R.E. +3.00D. sph.  $\approx$  +.50D. cyl. ax. 90°, vision 20/70; L.E. +2.00D. sph.  $\approx$  +.50D. cyl. ax. 90°, vision 20/25. The angle of squint remained practically the same and in June, 1932, a resection and recession were done on the right eye. The esotropia was not fully corrected, but with her glasses on her eyes looked quite straight and she was highly pleased with the result. No exercises of any type were employed.

The patient was not seen again until 1939. Her corrected vision was R.E. 20/50, L.E. 20/20. Her eyes looked perfectly straight, but the exact muscle balance was not recorded. Her refraction was practically the same. No fusion tests were made.

When seen in September, 1944, she had not been wearing glasses for several years, but she was beginning to have some pain in her right eye after reading. Corrected vision was R.E. 20/40, L.E. 20/20.

She had an esotropia of 6 prism diopters for distance and 3 prism diopters for near. The near point of convergence was 35 mm. Prism divergence was 9 degrees and prism convergence 28 degrees. Fusion was present, with a red glass and light, in all fields, and she could instantly fuse the Wells charts with a stereoscope. She was referred to the Orthoptic Clinic, where the technician reported normal fusion and stereopsis with the synoptophore and other instruments.

This patient presented the second case of esotropia seen in a period of 20 years in which apparently normal fusion developed without training. A slide was shown, made from a picture taken of her in 1932 just before operation.

#### EPITHELIOMA OF THE LIMBUS

DR. E. C. ELLETT reported a case of epithelioma of the limbus, cured after 24 years by excision, cautery, and radium.

C. R., a man, aged 42 years, was seen in 1920. There was a growth at the temporal limbus of the right eye which was increasing rapidly. It was elevated 5 to 6 mm. and had a rough surface. The vision was normal. Radium was applied by Dr. John Maury in August, and the growth was worse in October, when it was excised. The wound did not heal, and a recurrence was evident when he was seen in December. The growth was again excised and the whole surface was cauterized with actual cautery. Two applications of radium were made in the next week and the eye healed and remained well. The photograph taken 24 years later showed the eye; which had normal vision.

This case was reported especially because several similar cases had been reported to this Society in which the eye was removed. Dr. Ellett had been fortunate enough to see all the cases he had examined, cured by excision or irradiation or both.

The diagnosis of epithelioma was confirmed by microscopic examination.

#### CYST OF THE IRIS

DR. E. C. ELLETT reported a case of cyst of the iris, treated by iodine injection.

K. D., aged nine months, was seen in October, 1944. There was a cyst of the iris below, present since birth or soon after, which was slowly growing. It was gray-green, translucent, and fused with the iris. The cyst was punctured with two needles and while one drew off the fluid, tincture of iodine was injected into the cyst through the other. About six weeks later the eye was white, the cyst more opaque but smaller, and the eye seemed normal otherwise.

The nature or origin of cysts of the iris is not definitely known, if we except implantation cyst from trauma. Some are mesodermal in origin, others ectodermal. In other words, some have endothelial walls, others epithelial. Excision is the best treatment if the cyst is small.

#### COLLEGE OF PHYSICIANS OF PHILADELPHIA

##### SECTION ON OPHTHALMOLOGY

December 21, 1944

DR. WARREN S. REESE, *chairman*

#### SUPRASellar MENINGIOMAS WITH SCOTOMATOUS FIELD DEFECTS

DR. BERNARD J. ALPERS and DR. N. S. SCHLEZINGER (by invitation) presented a paper on this subject.

*Discussion.* Dr. Water I. Lillie stated that acute precipitous visual changes are due to inflammatory, vascular, or toxic conditions whereas tumors usually produce a very slowly progressive visual syndrome. In the prechiasmal area this does not hold true, due to the anatomic variations so well brought out by Shaeffer

and deSchweinitz. Suprasellar meningiomas almost always have their origin in the tuberculum sella (Cushing), and a certain percentage produce a prechiasmal syndrome. This latter group was presented in Dr. Schlezinger's cases.

One must decide early whether the lesion is inflammatory or neoplastic. A thorough general and neurologic examination, including a spinal-fluid examination, is important before making a definite diagnosis. Multiple sclerosis is a common cause for such syndromes, and the spinal fluid will usually show an increase in the number of cells and a Zone-1 colloidal gold curve. In a chronic type of inflammation, the arachnoiditis type, or suprasellar tumors, metabolic changes occur at the same time or after the visual disturbances, which easily differentiates them from intrasellar lesions. The encephalogram is also an aid in differentiating the suprasellar tumors and chronic basal arachnoiditis.

These two conditions are surgical, and do not respond to medical therapy. Ophthalmologists should insist on an early diagnosis, so that the neurosurgeon can institute the proper therapy. The results are excellent, the mortality rate is very low, and the patient obtains useful vision.

#### PENETRATION OF PENICILLIN INTO THE RABBIT'S EYE WITH NORMAL, INFLAMED, AND ABRADED CORNEA

DR. IRVING H. LEOPOLD and DR. WILLIAM O. LAMOTTE, JR. (by invitation) said that in order to establish the best mode of therapy, it is important to know the penetrating ability of locally instilled penicillin in ointment and solution. This ability has been studied in (a) the normal rabbit eye, (2) the inflamed rabbit eye, and (c) the normal rabbit eye with corneal epithelium denuded.

These investigations show that one application of penicillin, either in liquid or ointment (ointment base recommended by the Committee on Surgery of the CMR) vehicle into the normal rabbit eye, fails to produce a detectable level in the aqueous humor. One instillation of liquid consisted of four drops of 500 units per cubic centimeter, and one application of ointment consisted of 125 grams containing 500 units per gram. The biologic method used for analysis of penicillin could disclose .02 units per cubic centimeter. If applications of either liquid or ointment were repeated every 15 minutes for one hour, aqueous-humor concentrations were still below .02 units per cubic centimeter.

*Pasteurella leptisepticus* was used to produce standard corneal ulcers in rabbit eyes. Only one instillation of penicillin solution or ointment in these eyes produced aqueous-humor levels that were quite high. Aqueous concentrations were in the vicinity of 0.2 to 0.4 units per cubic centimeter within 15 minutes of one application of liquid, and were greater than 0.2 units per cubic centimeter 1 hr. and 45 min. later. Aqueous concentrations, after one application of ointment, were similar to those with liquid, except that the highest concentration obtained with the ointment was reached at 45 minutes, and with the liquid at 15 to 20 minutes after the instillation.

Small corneal abrasions were produced by mechanical means. The aqueous concentrations obtained in these eyes, immediately after the denudation, were similar to, but slightly greater than, those found in inflamed rabbit eyes. These eyes showed no evidence of inflammation.

Studies also disclosed no significant influence of penicillin solution consisting of 500 units per cubic centimeter on corneal-epithelial regeneration.

The following significant conclusions can be drawn from these studies:

(1) Penicillin in solution or in ointment fails to penetrate into the aqueous humor of the normal rabbit eye after one local instillation, but will penetrate readily into the anterior chamber of rabbit eyes with corneal abrasions or with corneal ulcers.

(2) The concentrations obtained in the anterior chamber of the eyes with inflamed or abraded corneas, following local instillation of penicillin, exceed the probable therapeutic level.

(3) It is not necessary to resort to iontophoresis, corneal-bath technique, or subconjunctival injections in order to obtain effective aqueous-humor concentrations of penicillin in eyes with infected corneal ulcers or corneal abrasions.

(4) Instillation of penicillin solution (500 units per cubic centimeter of normal saline) or penicillin ointment (500 units per gram) need be made only once every two hours into the subconjunctival cul-de-sac to maintain high aqueous-humor concentrations.

(5) Repeated applications of penicillin solution (500 units per cubic centimeter) does not significantly retard corneal epithelial regeneration.

*Discussion.* Dr. Francis Heed Adler said that it is not often that the simplest way of treating a disease turns out to be the best, but these experiments show that this is true in the case of penicillin in the therapy of acute anterior-segment inflammations. He said he had seen two patients develop a sensitivity to penicillin used locally. He asked Dr. Leopold whether he had seen sensitivity develop in experimental animals, and whether the organism that he used to obtain an experimental keratitis was one which penicillin itself would kill. If that was so, did he find any difference in the curative value of peni-

cillin by different methods of administration.

Dr. Irving H. Leopold, in answer to Dr. Adler's first query concerning local sensitivity from the use of penicillin, said that it is surprising how few cases of sensitizations are seen, considering the huge doses of penicillin that have been used generally as well as locally. Actually, however, reports are appearing in the literature that suggest local sensitization to penicillin. Two cases are reported in the November issue of the Archives of Dermatology and Syphilology concerning contact dermatitis from penicillin. There is also a note in the same issue by Welch, *et. al.*, indicating that penicillin when injected intradermally will produce sensitivity. One must be on the lookout for allergic manifestations to this drug, just as when the sulphonamides are administered. Actually, no signs of contact dermatitis were seen in the rabbits, but the rabbit is a notoriously poor type of animal in which to demonstrate such hypersensitivity.

In answer to the second query, this organism, *Pasteurella leptisepticus*, was found by routine culture in the rabbits' eyes. It is a gram-negative bacillus which was found to be sensitive to penicillin. Bacteriologic studies at first gave the impression that this was a previously undescribed organism, but further study and consultation with Drs. L. A. Julianelle and L. F. Rettger indicated that this organism, although not identical, most closely resembled *Pasteurella leptisepticus*. Corneal infection was produced with this organism in a series of rabbits, the therapeutic effectiveness of local penicillin was compared, and penicillin therapy was administered systemically. The penicillin that was administered intramuscularly failed to have any influence on the corneal ulcers, whereas all eyes

treated locally with penicillin responded favorably to the therapy.

Dr. Francis Heed Adler asked whether the weight of evidence would point toward using the drug locally in all cases, rather than by the intramuscular route.

Dr. Leopold, in closing, said that all studies indicate the superiority of local over systemic administration of penicillin for corneal infections due to penicillin-sensitive organisms.

#### SYPHILITIC IRITIS WITH PARTICULAR REFERENCE TO THE HERXHEIMER REACTION AS A DIAGNOSTIC AID AND RESPONSE TO DIFFERENT TREATMENT INCLUDING PENICILLIN

DR. JOSEPH V. KLAUDER, by invitation, and DR. GEORGE J. DUBLIN discussed the following questions: (1) How valid is the diagnosis of syphilitic iritis based solely on a positive Wassermann reaction, or such diagnosis in the late stage of syphilis or when the duration of infection is unknown? (2) What are the criteria of the efficacy of antisyphilitic treatment to justify the conclusion that iritis was caused by syphilis?

Antisyphilitic treatment exerts a non-specific effect on iritis. Judgment at times is difficult, since local treatment and non-specific therapy exert favorable action on iritis. The purpose of this paper was to discuss these considerations, and also the Herxheimer reaction of the ocular lesion as evidence of syphilitic causation. The intensification of the inflammatory process (constituting the Herxheimer reaction) was evaluated by slitlamp examination conducted before and soon after antisyphilitic treatment. The Herxheimer reaction as observed through the corneal microscope has heretofore not been employed in diagnosis.

Of 33 patients with syphilitic iritis, three were treated with penicillin. The

case record of one was detailed; the flare-up of the ocular lesion (Herxheimer reaction) after penicillin was described; the period required for the iritis to become quiescent, and the effect on skin and mucous-membrane lesions were discussed.

In order to avoid too pronounced Herxheimer reaction and too rapid retrogression of the inflammatory lesion (therapeutic paradox), reduced initial doses of penicillin were employed—10,000 units for the first four injections in contrast to 50,000 units employed in treatment of early syphilis. Total dosage of 2,400,000 units of penicillin was administered in the treatment of two patients, and 1,200,000 units of penicillin was administered in the treatment of one patient with syphilitic iritis who had associated secondary syphilis.

The iritis of the three patients treated with penicillin became quiescent within 12 days. This compared with two to five weeks in patients treated with chemotherapy and fever combined with chemotherapy.

*Discussion.* Dr. Alfred Cowan said he agreed with the authors in that there are very few definite objective features in syphilitic iritis or uveitis that cannot be found in almost any other type of severe uveitis. In his experience papules are rare. Certainly, ophthalmologists seldom make any distinction between the two, so that an appearance that might be considered characteristic of syphilis is not definitely diagnostic of the disease.

Formerly, syphilitic iritis was diagnosed much more easily than today. Then, when a case of severe iritis was seen, if the person were not an alcoholic, had no tuberculosis, and had had no rheumatism, the infection was regarded as of syphilitic origin. This accounts for the great proportion of cases that were then supposed to have been caused by syphilis as com-

pared with the proportion of cases now in which syphilis is the cause.

Dr. Cowan asked Dr. Dublin in how many of the 33 cases he had found lesions that resembled papules. He said he remembered the time when he was very careful to send cases that were thought to be due to syphilis to the syphilographers before he treated them, lest they be given too vigorous treatment, and by a severe reaction produce a certain amount of damage that could never be repaired.

Dr. George F. J. Kelly asked if these cases showed general signs of a Herxheimer reaction, or if this was confined only to the eyes. It was stated that these eyes were examined with the corneal microscope 16 to 18 hours before the patients received their injections. He asked if they were examined again before receiving the injections. He stated that penicillin was referred to as a spirocheticide. He asked if this is regarded as a proved fact.

Dr. George J. Dublin, in reply to Dr. Cowan's question as to whether any nodules were noticed in the iris in this series of cases, said that it was his impression that approximately five cases were seen in which nodules were present. The nodules noted were distinct masses, and were not present at the first examination, at least if they were present, they were overlooked. The last case in which a large mass was noted in the iris was seen by Dr. Alfred Cowan, three days after he had seen and described the case to his residents at Wills Hospital, using this case for demonstration purposes. This was the same case that Dr. Klauder had spoken about wherein fever therapy had caused a tremendous improvement prior to penicillin treatment. When he first saw this case, he said there was noted a pronounced massive nodule in the lower portion of the iris below the pupillary

border. When he reexamined the case five days later, there was no evidence of this mass at all. There was a very slight atrophy of the iris at this point. This mass had disappeared faster than any that he had ever observed.

In regard to the question as to whether there had been noted any general manifestations of too rapid a Herxheimer reaction, it was his belief that this reaction occurred in only one case; and this was in a case following penicillin injection wherein the patient complained of severe headache. It was felt that this complaint was a general manifestation of Herxheimer reaction, and he did not believe any other reaction was noted. A patient is usually examined by slitlamp microscopy one or two hours prior to the injection of an arsenical, and approximately 16 to 18 hours after the injection. The patients receive from 0.30 to 0.45 gm. neoarsphenamine, in order to avoid the possibility of too rapid a destruction of the tissues or too rapid a cure.

It is interesting to note the different features of luetic iritis by slitlamp microscopy, because this was the first time they had been fortunate enough to be able to see, to a fairly high degree, pathologic change in the anterior segment of the eye. They classified the reactions as positive in four different stages:

In the first stage, after 18 hours, it was observed that there was some clouding of the cornea, some fine keratitic precipitates, and a slight aqueous flare; in the second stage, there was noted a pronounced haziness and cloudiness of the cornea, marked aqueous flare with turbidity, with many floating cells in the aqueous; in the third stage, all the aforementioned findings were present together with nodules in the iris. Some of the nodules had a reddish tint whereas others had a yellowish color.

All of the nodules were close to the pupillary border or immediately adjacent to it. In only one case was a mass noted near the root of the iris. In the fourth stage were those cases in which was found a spongy exudate (fibrinous iritis) together with a frozen aqueous.

Evidence of a positive Herxheimer reaction prior to the advent of the slitlamp have been deduced by various physical signs that have appeared; for instance, headaches following injection of an arsenical, or rupture of an aneurysm following antisyphilitic treatment. It was not felt that the positive Herxheimer reaction, particularly as noted by slitlamp microscopy, is an infallible sign of syphilis. However, it is of help as a diagnostic aid in a high percentage of cases. Even where there is distinct clinical evidence of syphilis, there may be a negative Wassermann. There has been a small percentage of positive Herxheimer reactions in nonluetetic cases, and it is not possible to explain this factor at this time. He said, however, that they are working on a number of control cases, and hope to have more accurate figures and deductions in the near future.

This paper was presented only as a preliminary report. No hard-and-fast conclusions can be made at this time, but it is hoped that some definite conclusions will be reached in the future. At this time it is felt, however, that a positive Herxheimer reaction as noted by slitlamp microscopy is an addition to the laboratory and clinical methods of examination including the Wassermann test; that it is positive in a large percentage of cases, and should be considered as a diagnostic aid in cases of luetic iritis.

George F. J. Kelly,  
*Clerk.*

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## THE RETURN OF THE EX-MEDICAL OFFICER

Every day increasing numbers of medical officers are being released from the armed services and are returning to their communities, where they hope and plan to take their proper places in civilian practice. The number of these individuals is not large at the moment, but during the next few months particularly, the acceleration in the return will become manifest. We should be prepared to do everything within our power to give these men hearty welcome and practical assistance.

Let us frankly face the fact that there

are bruised feelings and much self-pity on both sides of the line between the medical officer and the civilian. The efforts we have all made in this terrible venture have taken much out of us. All of us are jittery and confused. There are many signs of the irritation of fatigue all around us, throughout the world, and in every walk of life; and ophthalmologists are people, too.

Let us also frankly acknowledge that there is some resentment on the part of the medical officer against his civilian colleague. It is difficult to measure this feeling, which has always germinated and

developed in an atmosphere of utter boredom, frustration, and unhappiness and which feeds on itself. It was present after the last war, but to a limited extent because of the relatively short duration of the war.

The end of the war found many expert ophthalmic surgeons with nothing or, at best, little to do. If they were occupied at all it was mainly with routine work of an uninspiring nature. There was plenty of time to brood, often in uncomfortable physical surroundings. Those who were (and are still) overseas pined for their families and home. This homesickness, which no one who has not experienced it can ever understand, is a physical pressure, a melancholy, a black-bile humour that creates a sense of being only half alive. There is too much idle time on hand, and it is partly spent in worrying about the well being of loved ones and particularly over the economic and professional future of the individual. There is a growing lack of confidence in one's own professional skill and ability, which seems to be endlessly rusting away through disuse. There is the loss of stimulus from the lack of library facilities, of conferences with one's colleagues in ophthalmology, of chances to talk shop. No matter how strong his character may be or how strong the urge of ophthalmic ambition, if desuetude lasts long enough there comes a time when the medical officer loses his interest in study and finds himself reading mystery stories, playing cards, drinking more than he should, and doing everything else to have the time pass. He smolders over his failure to gain promotion or an award. He hears about the ophthalmic medical officer, not a member of the Board, who gets a majority or even a lieutenant colonelcy, or the equivalent in the navy. He knows that the people at home think that a promotion is a sign of one's ability, although

this is obviously not true, for all he has to do is to look around him in his own and other units. He is elated one minute and downcast the next, due to orders, rumors, and counterorders. There are a thousand and one things to gripe about, and he loses his sense of perspective. The longer the state of relative professional inactivity lasts, the more neurotic he becomes.

The men who stayed at home, either from choice, physical defect, or essential necessity, if they are of military age, are on the defensive, and eager to explain to their army or naval colleagues the reasons for not joining up. They, too, in most instances, are frustrated and unhappy men whose consciences prick them willy nilly. They reveal this unconsciously, sometimes by seeking to avoid the returned officer, more often by seeming or actual indifference to the past or present lot of the ex-medical officer.

The frame of mind developed by these experiences often creates a mutual state of embarrassment when the two first get together. It is particularly important, at this first meeting, that the two do get together and break down this barrier. Mutual trust and the good will of future relationships may hinge on this first meeting. Otherwise the reconstruction of peace-time respect and the rehabilitation of both parties may be intolerably delayed and create mischief in our ranks.

The civilian doctor has worked many hours overtime. His offices have been crowded beyond capacity, in most instances. The hospitals are overfull and bed space is at a premium. The wages he pays, taxes, and overhead expenses have increased by staggering amounts. He has made a greater gross income but ends up with less net, as a rule. He has been caught in a treadmill of service to the people. This overwork has already resulted in many casualties among our older



men and leaders that American ophthalmology can ill afford. Their loss is as surely ascribable to war as if they had died in battle.

The teaching staffs of medical schools and hospitals have been depleted, extra work has had to be done by those who remained. The accelerated courses will have had an effect on teachers and students that is now beginning to become manifest. Fortunately, there were very few of the younger men of military age who, relieved of military responsibilities for physical or other reasons best known to themselves, seized advantage of the conditions and have made a good thing out of it. The great majority devoted themselves conscientiously to looking after the absent colleague's patients and interests and will gladly welcome the day of his return.

While he was away on service the medical officer received information through the medical journals and correspondence that much would be done to ease him into civilian life on his return. His hopes were built up and he felt grateful to his friends and colleagues for this interest. However, due to many factors, some beyond the power of the different societies to avoid, much of this planning remained in the paper stage only, and the medical officer on his release from service feels let down and is disillusioned. Perhaps many of the schemes were too ambitious, some too difficult, and others impractical of fulfillment. Others got off to a late start, but start they have and it is good to cite an example of what is being done by one local society. According to the Ohio State Medical Journal (October, 1945), the Columbus Academy of Medicine has formed a committee, chairman Dr. C. C. Sherborne, that has developed nine points in a program of actual and workable assistance to the ex-medical officer. These are:

(1) Arrange through the Medical Bureau for the assignment of a temporary telephone number, which will be listed at the Bureau address and will be answered by that office so that those expecting discharge within the next few months may have their names carried in the next telephone directory.

(2) Contact real-estate boards and rental agencies to request the filing with the Academy office of information data regarding available office locations; also, to request the special coöperation of these groups to assist returning physicians to secure adequate office space.

(3) Secure information about the opportunity to enter practice as assistants or associates with doctors now engaged in local practice.

(4) Secure information about openings for returning physicians, on either part-time or full-time basis, in various local state institutions.

(5) List the names of all returned doctors periodically in the Academy Bulletin, so that their names will be known to all other physicians in order that former patients may be immediately referred back to these war-service members.

(6) Arrange for newspaper announcements, under official Academy sponsorship, regarding the return to practice of war-service physicians.

(7) List at the Academy office the openings of residencies in local hospitals.

(8) Provide information regarding postgraduate instruction and refresher courses.

(9) Arrange through the Academy office for financial assistance.

These are all eminently sound principles upon which to act, and are not difficult to carry through. If each local medical society would carry out the above program, much good will ensue.

The matters of office space and equipment are serious. The local society

through its real-estate committee could act as a clearing house for information regarding office space. Doctors who may have some excess space they could turn over could notify this committee and give the ex-officer a break in finding room in which to work. Perhaps temporary arrangements in the use of a colleague's office and equipment during certain hours would tide the ex-medical officer over some stormy days while he is getting his own space settled.

New equipment, particularly ophthalmic, is most difficult to get. The instrument houses are cooperating fully, however, and if the returned physician will enclose a copy of his service certificate with his order, the chances are that a high priority will be given the order, and delivery of the equipment and instruments expedited.

Last, but not least, should be mentioned the social welcome home of the returned medical officer. The local ophthalmological society can do a good service here by setting aside at its monthly meeting a time devoted to welcome by name and honor in person those ophthalmologists, fellow members, who have returned to civilian life during the month. A hearty handshake and an honest welcome will go a long way toward the reaffirmation of friendships and trust. It need not be formal or speechmaking in nature, but it must be sincere.

Derrick Vail.

## BOOK NOTICE

REFRACTION OF THE EYE. By Alfred Cowan, M.D. Second edition. Clothbound, 278 pages, 181 engravings and 3 color plates. Philadelphia, Lea and Febiger, 1945. Price \$4.75.

With an excellent background of theoretical and practical physiological optics

and many years' experience in the teaching of this subject at the University of Pennsylvania, the author published the first edition of "Refraction of the eye" in 1938. This book has since become a standard reference work in its field.

In this second edition there is very little change from the earlier publication, and almost no new material has been added except for a somewhat more detailed discussion of such subjects as contact lenses and aniseikonia, in keeping with more recent advances. The inclusion of a few new diagrams and minor rewriting of some of the explanatory material serve further to clarify an already lucid text. The section on physiological optics, which constitutes the major portion of the book, is particularly valuable because of the practice, continued from the earlier edition, of adding a brief recapitulation at the conclusion of various chapters, thus serving to summarize the important points in the more or less involved material under discussion. The objective and subjective methods of refraction necessarily reflect the personal beliefs and practice of the author but nevertheless offer an excellent working basis for the student. The description of the various types of bifocals is particularly practical.

Increased amount of material per page, in keeping with modern practice, has resulted in a reduction of the total number of pages from 319 to 278, but the text remains extremely legible and well printed.

As has been well demonstrated by the examinations of the American Board of Ophthalmology the field of physiological optics is one in which ophthalmologists frequently show a deficiency. Dr. Cowan's efforts should continue to be of help in preparing students in this phase of their theoretical and practical training.

William A. Mann.

## CORRESPONDENCE

COMMONLY USED OPHTHALMIC DRUGS  
OF LITTLE VALUE

Editor,

American Journal of Ophthalmology:

In view of the remarkable advances made by science in the field of medicine, it is surprising and, in fact, extremely embarrassing to find that the ophthalmologic profession continues to use popularly known, but ineffective medicines. Among these drugs of little therapeutic value are boric acid, silver nitrate, dionin, and yellow oxide of mercury. I could add others to this list, but I am pointing out those, in particular, which have failed grossly to keep pace with modern therapeutics.

In the Journal of the American Medical Association, September 29, 1945, there appears an article by Dr. E. H. Watson on the subject of boric acid. Dr. Watson reports his findings from the Department of Pediatrics and Communicable Diseases, University of Michigan Medical School, Ann Arbor. He points out the toxic effect of boric acid, especially when used in ointments and in solutions for use in maternities. He stresses the toxic effect when used as a solution for irrigation of the stomach and bladder. He summarizes his article in short conclusive sentences as follows:

Use of boric acid preparations should be discouraged because of their limited usefulness and the real dangers of their accidental and intentional use. The medical profession as a whole probably puts unwarranted confidence in boric acid preparations and is likely to forget that boric acid is a poison.

Of course, ophthalmologists have not found boric acid to be poisonous or even irritating when used as an eye wash. It is widely used by the laity. The ophthalmic profession has used it as a collyrium for years, and its effectiveness in all forms of

external eye diseases has been taken for granted. Personally, I have found no objection to a saturated boric-acid solution as an eye wash, nor have I found it to be harmful. At least a saturated solution is less irritating to the eye than is sterile water or ordinary tap water. Perhaps the effectiveness of boric acid as an eye wash is hidden in the effectiveness of water itself as a cleansing agent. If a cleansing agent is desired for the eye, then a normal salt solution is desirable, for sodium chloride is one of the natural constituents of the lacrimal secretion. I do not consider this latter point, however, of great value in discouraging the use of boric acid. From a scientific standpoint alone, I know that boric acid has little bactericidal value and for this reason it should be relegated to the scrap heap as an unimportant drug.

I expect many of my colleagues to come to the defense of boric acid, but I believe such defense will have mere sentimental backing, the only support being that it is an old and tried drug and not suspected of having the toxic effects as reported by Dr. Watson. It is true that the older ophthalmologists have been taken aback by the debunking of their favorite preparation through scientific research, but I am sure that the younger men in the medical world are in favor of shelving the old in favor of the new.

For many years I have favored the elimination of silver nitrate as a preventive agent for ophthalmia neonatorum. The fact that 60 years ago Carl Siegmund Franz Credé presented to the world a method for preventing blennorrhoea in the newborn does not mean that the sulphadiazine and penicillin should be ignored out of respect for a previous discovery.

In 1934 I conducted a survey for the Department of Public Health, Philadelphia, concerning the limitations of

silver nitrate in the prevention of ophthalmia neonatorum. At that time I pointed out that silver nitrate, either 2 percent or 1 percent, was not gonococcicide nor a germicide of any great value, especially when used as a preventive agent in the eyes of the newborn. Before publishing my report I conferred with my esteemed friend, the late Dr. George de Schweinitz, who was then chairman of the Committee for the Prevention of Blindness of the Philadelphia County Medical Society, of which I was a member. He reviewed with me the preliminary findings of my report, which proved beyond doubt that the Credé method for the prevention of ophthalmia neonatorum was grossly ineffective in the light of methods used at that time; namely, the year 1934. Instead of recommending the abandonment of the use of the silver nitrate, I compromised with Dr. de Schweinitz by recommending a 0.5-percent solution of silver nitrate to be used in the eyes of the newborn on three successive days, preceded, of course, by thorough mechanical flushing of the eyes. It was my thought at that time that the treatment of gonorrhea in the expectant mother was one of the most important phases in the prevention of ophthalmia neonatorum. Dr. de Schweinitz thought it would be indiscreet to tell the public and the medical profession that the Credé method was not held in such high esteem by scientists, and that the sudden loss of confidence in this method might lead to an outbreak of ophthalmia neonatorum. I took the advice of my senior, knowing that his more mature judgment should be followed.

However, 10 years have passed and

many effective drugs for the prevention of ophthalmia neonatorum are on the market. Silver nitrate will go down in history simply as one of the methods tried in the late nineteenth and early twentieth centuries.

Dionin is another drug which, I believe, has no value in ophthalmology. Whoever created the slogan that dionin is a lymphagogue certainly deserves a prominent place as a publicity agent. There has never been any proof that dionin produced lymph in tissues where there was no lymph, nor that it has any actual effect in reducing the density of scars. If "time" were to be compared with dionin, I think that the time factor would far exceed dionin as an agent in reducing corneal scars.

Just what effect yellow oxide has on the eyelids remains to be proved. I have not found it to be effective, unless it was the ointment base. It would be short of folly and a waste of time and effort to enter into any controversy that would be scientific in nature to discuss the effectiveness of yellow oxide of mercury. Yes, many ophthalmologists and thousands of lay persons will testify as to its value, but I would like to have one prove by laboratory methods that yellow oxide of mercury, as it is now offered on the market, has any value whatsoever when used as a local agent in the treatment of eye diseases.

I think it is time that ophthalmologists clean house, particularly in connection with their therapeutic shelves.

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# ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

## CLASSIFICATION

- |  |  |
|--|--|
| 1. General methods of diagnosis                        | 10. Retina and vitreous                                |
| 2. Therapeutics and operations                         | 11. Optic nerve and toxic amblyopias                   |
| 3. Physiologic optics, refraction, and color vision    | 12. Visual tracts and centers                          |
| 4. Ocular movements                                    | 13. Eyeball and orbit                                  |
| 5. Conjunctiva   | 14. Eyelids and lacrimal apparatus                     |
| 6. Cornea and sclera                                   | 15. Tumors   |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries   |
| 8. Glaucoma and ocular tension                         | 17. Systemic diseases and parasites                    |
| 9. Crystalline lens                                    | 18. Hygiene, sociology, education, and history         |
|  | 19. Anatomy, embryology, and comparative ophthalmology |

### 1

#### GENERAL METHODS OF DIAGNOSIS

Dashevskii, A. I. Color-contrast tables for examination of night vision and diagnosis of night-blindness. *Viestnik Oft.*, 1943, v. 22, pt. 5, p. 20.

In the last war there were many complaints of night-blindness, some real, others simulated. A simple portable device is based on Kravkov-Vieshnevsky's more elaborate apparatus for examination of dark adaptation by utilization of the Purkinje phenomenon. While the normal individual when dark adapted sees first blue, the hemeralope sees first yellow among colored objects. The device consists of 21 cards in a small box, and so built that it can be readily transformed into an adaptometer, with a slit diaphragm and a scale for varying illumination on top, and openings at the sides for simultaneous testing of the patient and the normal examiner, whose responses are compared. No preliminary dark adaptation is required. Both examiner and patient are light adapted for 10 to 12 minutes to the same source of illumi-

nation. Three cards with the same gray squares on the left and a series of darker grays on the right are used for determining the light-minimum thresholds. The remaining 18 cards consist of six series with red, orange, yellow, green, blue, and purple squares on the right, and from two to four shades of gray on the left, for quantitative exploration of the Purkinje phenomenon. The results are graphically recorded by entering the colors on the abscissa and the gray series on the ordinates. The result is a straight line for the normal at 45 degrees, a horizontal line for the total hemeralope, and a broken curve intermediate between the two others for the partial hemeralope.

M. Davidson.

### 2

#### THERAPEUTICS AND OPERATIONS

Ackerman, R. L. Penicillin in ocular therapy. *Viestnik Oft.*, 1944, v. 23, pt. 1, p. 45.

Penicillin has been found effective in 34 cases of which 16 cases were of conjunctivitis, including 11 with pneu-

nococcus in the smear, and the rest cases of corneal foreign body.

M. Davidson.

Babudieri, B., and Bietti, G. B. Electron microscopic observations on bacteriolysis produced by lysozyme of tears. *Arch. of Ophth.*, 1945, v. 33, June, pp. 449-454.

Two strains of gram-negative cocci of the sarcina type were exposed to lysozyme of tears and the resulting bacteriolysis studied by the electron microscope. The stages of disintegration differed considerably from those produced by bacteriophage or by the sulfonamides. (18 electron microscopic photographs, references.)

John C. Long.

Leopold, I. H., and Steele, W. H. Influence of local application of sulfonamide compounds and their vehicles on regeneration of corneal epithelium. *Arch. of Ophth.*, 1945, v. 33, June, pp. 463-467.

The influence of various sulfonamide compounds and ointment bases on the rate of healing of experimental corneal abrasions was studied in the rabbit. It was found that locally-applied ointment bases and powder bases alone and sulfonamide-containing ointments and powders deterred regeneration of corneal epithelium to a greater degree if the denuded area included the limbus. There was little significant difference between the effect of ointment bases and powder bases alone and that of sulfonamide-containing ointments and powders on the rate of regeneration of corneal epithelium. A 10-percent solution of sodium sulfadiazine had little or no retarding effect, even on lesions involving the limbus. From this observation it would seem that the major

detracting action of sulfonamide compounds on regeneration of corneal epithelium must be due to some mechanical effect of the vehicle. Corneal scarring was more frequent in the treated denudations than in the untreated ones, but in the incidence of scarring there was no difference between eyes treated with sulfonamide ointments and powders and those treated with the simple ointment bases and powders used as vehicles for the sulfonamide. (3 tables.)

John C. Long.

Plitas, P. S. Ultrahigh-frequency-field therapy in certain eye diseases. *Viestnik Oft.*, 1944, v. 23, pt. 1, p. 32.

The author called attention in 1935 to the experimental evidence of histopathologic changes in the ganglion layers of the retina and in the optic nerve, resulting from exposure to the excessive heat of ultrashort radio waves. Shibkova demonstrated in addition changes in the nervous system in the same experimental animals. Other investigators have arrived at the conclusion that other effects beside that of temperature are involved in the exposure of tissues to the condensation field of ultrashort waves. The author favors small dosage short of heat and uses 6.1-m. waves, at 15.5 V. and indicator 1.0 of the "Ultrapandoros" apparatus, with 45-mm. round bitemporal electrodes, 1.5 to 2 cm. from the diseased eye and 2 to 3 cm. from the healthy eye. The sessions are five to six minutes, repeated daily at times, but mostly every other day, a course being of ten sessions. The best results have been secured in traumatic iridocyclitis and anterior-segment tuberculous lesions, and in sclerokeratoiritis, scleritis, and episcleritis. No appreci-

able results were obtained in hypopyon ulcer, trachomatous ulcer or phlyctenular keratitis. After two or three sessions pain is relieved and injection disappears. Absorption of infiltrates is evident by the eighth or ninth session.

M. Davidson.

### 3

#### PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Dilthey. Accommodation spasm caused by Albucid? *Klin. M. f. Augenh.*, 1941, v. 107, July, p. 75.

A case report of transitory myopia probably caused by Albucid medication in a 41-year-old female. In spite of the fact that cycloplegia with atropine failed to neutralize the myopic status, the author is inclined to assume that the change in refraction was caused by accommodative spasm, induced by the Albucid.

F. Nelson.

Pascal, J. I. Visual exercises in ophthalmology. *Arch. of Ophth.*, 1945, v. 33, June, pp. 478-481.

Exercises designed to improve central macular vision do not increase macular activity in the physiologic sense but bring about improvement through intensification of the psychic phase of the act of seeing. Treatment of amblyopia ex anopsia by exercise is an excellent example of such intensification. Why cannot this process be extended? If the psychic contribution to vision can be so greatly enlarged in these cases after correction of the ametropia, why cannot it be developed, to some extent at least, without correction of the ametropia? Why cannot the mind be trained to respond to an unfocused retinal blotch? Not only may central vision be improved by suitable

exercise but recently it has been shown that peripheral vision as well may be intensified by training.

It is suggested that recent claims for the cure of color blindness by means of visual exercises should be examined with an open-minded attitude. Certainly no new structural elements can thus be developed in the retina nor can any new visual pigments be formed. Yet in the opinion of the author it is no exaggeration to say that persons taking these exercises have acquired a greater degree of color perception and color discrimination than they had before taking the exercises.

A type of visual exercise which is practiced by teachers and educators generally more than by ophthalmologists is concerned with improvement in the speed of reading. Akin to this type of exercise, but much more developed and on a broader psychologic basis, is the work being done to increase the speed and span of the visual act.

Visual exercises relating to the development of improved neuromuscular coördination of the two eyes constitute the well-known field of orthoptics. In many instances the ophthalmologist is not fitted by temperament or inclination to engage directly in the supervision of visual exercises. In such cases the work can well be carried out by the orthoptic technician under the supervision of the ophthalmologist. (References.)

John C. Long.

Posner, Adolph. Why dark glasses? *Sight-Saving Review*, 1944, v. 14, Winter, p. 161.

Dark glasses are useful in reducing the dazzle of strong light, but glasses can produce much harm because they do not protect against the heat rays of the sun. Burning of the maculae has

occurred as a result of looking directly at the sun or an eclipse, the wearer enjoying the false security of such glasses.

Brownish-gray lenses absorb the short and long ultraviolet rays and are best for mountain climbing. Flesh-colored and smoke (gray) lenses diminish the total quantity of light more uniformly over the entire range of the spectrum and should be worn by persons who are exceptionally sensitive to the dazzle of reflected light. Green and bluish-green are preferred for flying and beach wear. Lightly tinted lenses are of little practical value.

Francis M. Crage.

Steffen, R. Transitory myopia after treatment with Albucid. *Klin. M. f. Augenh.*, 1941, v. 106, May, pp. 597-599.

A 26-year-old male was treated for urethral gonorrhea with large doses of sulfa drugs, among them Albucid. A purely lental increase of manifest myopia from  $-1$  D. to  $3.5$  D. resulted, remaining after cycloplegia with homatropine and atropine. This increase disappeared completely within four days after cessation of the medication. (Bibliography.)

F. Nelson.

Trendelenburg, Wilhelm, An anomalouscope for examination of tritoform color-vision defect with spectral blue equation. *Klin. M. f. Augenh.*, 1941, v. 106, May, pp. 537-546.

Description of a new apparatus for examination of defects of blue perception. The instrument was originally designed by Nagel and can be used for examination of tritanomalous and tritanopes. For details the original article should be read. (2 tables, references.)

F. Nelson.

Trendelenburg, W., and Meitner, H. J. Differentiating value of the Stilling-Hertel charts for normal color vision and different types of color-vision defects. *Klin. M. f. Augenh.*, 1941, v. 107, July, pp. 12-19.

Stilling-Hertel's charts, 20th edition, were examined as to their differentiating value. Some charts were interpreted incorrectly by normal persons because the form of numbers and letters was not clear enough. The charts were classified as between those having no differentiating value and those well suited for the differentiating of persons with and without normal color sense. The authors discuss the possibility and necessity for differentiating anomalous from normal on the one hand and anomalous from dichromates on the other. (1 table, bibliography.)

F. Nelson.

#### 4

#### OCULAR MOVEMENTS

Hardy, Le G. H. Clinical use of ophthalmic prisms (metric). *Arch. of Ophth.*, 1945, v. 34, July, pp. 16-23.

This paper is a follow-up to a recent article on ophthalmic prisms. (*Amer. Jour. Ophth.*, 1945, v. 28, Oct., p. 1172) The various positions of holding prisms are analyzed, using mathematical formulae and graphs in the explanation. The practical summary to this somewhat technical paper is as follows: The clinical use of ophthalmic prisms for measuring deviations of the eyes involves little known but serious dangers of error, particularly in the higher powers. The units of prism strength are not usually marked on the prisms. Since several units are in use, this lack should be remedied. Great care should be used to avoid error in



placing metric prisms. If such errors are made, it is much safer to incline the prisms toward the position of minimum deviation than away from it. In measuring high degrees of deviation, it is much safer to divide the prism, holding approximately half the amount over each eye. (10 figures, references.)

R. W. Danielson.

Kamellin, Samuel. Management of paralysis of divergence. *Arch. of Ophth.*, 1945, v. 33, June, pp. 476-477.

Paralysis of divergence may be recognized by the following: 1. There is diplopia in the midplane for distant vision. 2. The diplopia is equal in all directions of gaze at the same distance from the subject's eyes. 3. The diplopia is eliminated as the eyes converge to near range. 4. The images are homonymous and separate farther as the test object is farther withdrawn from the subject.

The author describes the management of paralysis of divergence as carried out by the late Sanford Gifford. Patients with only a small amount of defect were given prisms base out to wear for distant vision. Patients needing a larger amount of prism base out for the correction of diplopia were advised to have an O'Connor cinch operation on one or both external rectus muscles. It is estimated that each strand of the cinch suture will correct approximately  $1\frac{1}{2}$  prism diopters of deviation when the operation is performed on the lateral rectus muscle alone. Two cases are reported in which the O'Connor cinch operation was successfully used. (References.)

John C. Long.

Putnam, O. A., and Quereau, J. V. D. Precisional errors in measurement of

squint and phoria. *Arch. of Ophth.*, 1945, v. 34, July, pp. 7-15.

The purpose of this paper is to examine the degree of precision obtained with the various methods of measuring phoria and squint. Three factors compose the errors in precision in any measurement: 1, inherent error in means or method; 2, human error in observation and manipulation; 3, error in degree of reproducibility, as in high precision determinations of weight or size of an object in which an average of varying results is necessary.

Four past and current means of measuring squint and phoria are considered: (1) prisms, (2) major amblyoscopes, (3) perimeters, and (4) the Hirschberg method. One new means, the Quereau-Putnam tropophorometer, is analyzed. The errors of the various methods and the means of compensation for them are discussed in detail. This article should be read by all interested in the accurate theoretical and practical measurement of squint. (7 figures, references.)

R. W. Danielson.

## 5

### CONJUNCTIVA

Glantz, Otto. Epidemic keratoconjunctivitis. Clinical aspects and successful treatment. *Klin. M. f. Augenh.*, 1941, v. 106, May, pp. 561-571.

A report about 312 cases of epidemic keratoconjunctivitis treated in Glantz's practice during 1938-1940. The majority (190) were spontaneous and of undetermined etiology. The rest occurred after: removal of corneal foreign bodies, other corneal lesions, chemical burns, lid abscesses, and removal of chalazion or lime concretion or pterygium. The main treatment was with

optochin hydrochloride 1-percent solution, which the author regards as a specific for the condition. The average duration was seven days. (3 tables, references.) F. Nelson.

Johansson, Ernst. Albucid treatment of trachoma. *Klin. M. f. Augenh.*, 1941, v. 107, July, pp. 72-75.

At the Municipal Eye Hospital in Litzmannstadt, ten fresh and untreated as well as fifty advanced cases of trachoma were submitted to internal treatment with Albucid, as advocated enthusiastically by Lindner. In addition, 388 trachoma patients regularly treated in rural trachoma clinics received Albucid. Though some influence of Albucid on the healing process seemed undeniable in certain instances, the author does not feel that the drug fulfills the high expectations as a cure for trachoma. F. Nelson

Kalfa, S. F. The treatment of trachoma by streptocide locally. *Viestnik Oft.*, 1944, v. 23, pt. 2, p. 39.

Encouraging results are reported in 14 cases resisting other treatment.

Kolenko, A. B. A modified Denig operation in annular pannus. *Viestnik Oft.*, 1944, v. 23, pt. 3, p. 46.

Because of the many objections to the use of lip mucosa—its liability to succumb to the trachomatous process, its disfiguring appearance and the awkwardness of suturing it—the author uses the ocular conjunctiva. Two parallel semicircular peritomies are made 4 mm. apart temporally and nasally, remaining attached at the 12 and 6 o'clock positions respectively. The two strips of conjunctiva are undermined and interchanged and sutured in place. The flaps are more viable than free trans-

plants and results are excellent, after an apparent deterioration in the pannus. Sutures are removed on the fifth or sixth day. M. Davidson.

Lauterstein. The treatment of chemosed, prolapsed, and strangulated conjunctiva. *Viestnik Oft.*, 1944, v. 23, pt. 3, p. 46.

Replacement and temporary suture of the two lids has been found very effective in a number of cases. The sutures are taken out on the fourth day. M. Davidson.

Lorenz, R. Decline of keratoconjunctivitis eczematosa. *Klin. M. f. Augenh.*, 1941, v. 106, May, pp. 556-561.

Comparative statistical evaluation of the total number of patients and the incidence of this disorder in the years 1909 and 1939 respectively, treated at the II University Eye Clinic in Vienna, included ambulatory and hospitalized patients. The four charts and four diagrams show that the hospitalized cases in 1909 were 6.5 percent of the total; in 1939, 4.5 percent. Ambulatory cases in 1909 were 13.66 percent; in 1939, 2.14 percent. Thus not only was there a general decrease of the disease, but the average was less severe. In 1909 a majority of the serious cases had to be content with ambulatory treatment, because the total incidence was so high that not enough beds were available; whereas in 1939 the total number had decreased so considerably that it was possible to be more liberal with hospitalization of the less serious cases. Lorenz attributes this striking difference to improvement of living and working conditions. (4 graphs, 4 tables.) F. Nelson.

Malbrán, Jorge. Antepositio conjunctivae fornicis. *Arch. de Oft. de Buenos*

Aires, 1943, v. 18, June, pp. 283-287.

The author has used this type of operation with good results in cases of vernal conjunctivitis with marked papillary hypertrophy. First advocated by Shimkin, the operation consists of resection of the affected tarsal conjunctiva and the advancement of the uninvolved conjunctiva of the fornix to cover the denuded tarsus. When vernal catarrh is complicated by trachoma, a partial resection of the tarsus is done at the same time. The surgical technique is described in detail. (4 illustration, references.)

Plinio Montalvan.

Pitter, J. A rare localization of Osler's disease beneath the conjunctiva. *Klin. M. f. Augenh.*, 1941, v. 107, July, p. 76.

A 51-year-old female with recurrent epistaxis since childhood developed telangiectases on the lips, the mucous membrane of the tongue, and the upper palpebral conjunctiva. Other members of the family were known to have suffered from epistaxis. F. Nelson.

Szinegh, Béla. Kalziphedrine in the therapy of eye diseases. *Klin. M. f. Augenh.*, 1941, v. 106, May, pp. 595-597.

The author recommends kalziphedrine medication in combating eczematous keratoconjunctivitis and allergic conjunctivitis. (References.)

F. Nelson.

Theodore, F. H. Parinaud's oculoglandular syndrome due to a yeastlike organism. *Arch. of Ophth.*, 1945, v. 33, June, pp. 471-475.

What was first known as Parinaud's conjunctivitis is not a definite disease with specific pathologic and bacteriologic characteristics but a symptom

complex which can be caused by a number of etiologic factors. The syndrome is characterized by a chronic unioocular granulomatous conjunctivitis with regional lymphadenitis. Tularemia, tuberculosis, an unidentified virus infection, lymphogranuloma venereum, syphilis, and even infections with the hemolytic staphylococcus and *Bacillus proteus* have been listed as causing the syndrome. By far the most common agent appears to be the leptothrix, first found by Verhoeff. The author reports a case of Parinaud's syndrome apparently due to an unidentified yeastlike organism.

The patient was a thirty-year-old man with a unilateral conjunctivitis accompanied by preauricular and cervical lymphadenitis and fever. Yellowish-gray nodules were present on the conjunctiva, especially at the upper tarsal border. Both the cervical and preauricular glands suppurred and drained, the cervical for a period of nine months. Biopsy material from the conjunctiva and smears from the preauricular gland contained yeastlike organisms. A culture of the material showed a growth of yeast but was accidentally destroyed before the organism could be positively identified. Leptothrix could not be found in the material. (4 photomicrographs, references.) John C. Long.

## 6

### CORNEA AND SCLERA

Azarova, N. S. Streptocide in anterior-segment affections of the eye. *Viestnik Oft.*, 1944, v. 23, pt. 1, p. 37.

In 35 cases of corneal ulcer including 21 with hypopyon keratitis and six with pupillary occlusion and seclusion, the application of streptocide within 5 to 15 days of duration of the ulcer gave brilliant results in from 10 to 15 days

with only very fine scarring and early epithelization, even before disappearance of the hypopyon. Phlyctenular-keratitis ulcers cleared up in 3 to 5 days.

M. Davidson.

Badtke, Günther. Peculiar cases of keratoconus with blue scleras, in two sisters. *Klin. M. f. Augenh.*, 1941, v. 106, May, pp. 585-592.

Two sisters eight and ten years of age from an isolated village in South Tyrol showed general feebleness, intelligence defects, dryness of skin and hair, delayed dentition, keratoconus, and typical blue scleras; probably all being manifestations of inferiority of mesenchymal development. The family tree was not well known. However, it could be proved that eye diseases and blindness were rather common occurrences in the family and that intermarriage was frequent. (3 illustrations.)

F. Nelson.

Chan, Eugene. Blue sclerotics associated with bony defects. *Jour. Internat. College Surg.*, 1945, v. 8, March-April, p. 140. (See *Amer. Jour. Ophth.*, 1945, v. 28, Nov. p. 1282)

Feldman, L. L., and Shartz, S. E. Therapeutic keratoplasty in serpent ulcer of the cornea. *Viestnik Oft.*, 1944, v. 23, pt. 1, p. 27.

Preserved corneas, first used by Filatov in 1933, and applied by Chechin-Kunina in 1940 in the treatment of hypopyon keratitis, have been tried in 16 cases. Of these, 15 were of traumatic origin and one of unknown cause, in persons aged from twenty to seventy years, and with various bacterial flora. In the majority most of the cornea was involved, while eight had hypopyon and two had perforations. All had the bene-

fit of milk injections and urotropin, some in addition Bucky X-ray therapy, paracentesis, cauterization, and streptocid internally. The transplants used were from 14 cadaver eyes and from two living eyes. The majority had the transplantation done between the tenth and twentieth day after ulceration. A trephine was used to remove the corneal area of greatest infiltration. The hypopyon was removed, and then the transplant was placed. Under slitlamp observation after the transplanting, the corneal infiltration, before operation diffuse, became circumscribed, and the corneal ulceration cleared. Vascularization invaded the membrane formed back of the transplant, but never invaded the transplant. The membrane adhered to the transplant and at times retracted it, whereas at other times fluid accumulated between them and the transplant bulged. The pain disappeared, progress of the ulcer was stopped, and the hypopyon was not renewed. In one half of the cases visual acuity was improved by operation. The benefits of the procedure are ascribed to replacement of diseased cornea with transparent cornea instead of by scar tissue, to improved nutrition of the remaining cornea, and to lowering of tension. Several of the cases were complicated by intraocular hypertension, usually controlled by iridectomy or miotics. One eye had to be eviscerated. The author concludes that the operation is indicated in very severe cases of hypopyon keratitis with otherwise hopeless prognosis. Its purpose is not so much to secure improvement in vision but to save the eye from being a total loss.

M. Davidson.

Ivanova, E. A. The treatment of corneal ulcers. *Viestnik Oft.*, 1944, v. 23, pt. 3, p. 34.

Ochapovskaya's blood-serum treatment for corneal ulcers, based on the principle that corneal tissue deprived of its epithelium should benefit from the nutritive elements including the oxygen of the red cells and immune bodies and enzymes, has been modified and applied to 26 cases, 19 of which showed pneumococci in smears. A larger quantity of the patient's own blood is used, coagulum removed, and serum stored and used in the form of a collyrium. The results were satisfactory, and the method is recommended as an addition to our armamentarium—always available and cheap.

M. Davidson.

Kaminski, D. S. Albucid iontophoresis in the treatment of hypopyon keratitis. *Viestnik Oft.*, 1944, v. 23, pt. 3, p. 31.

Experiment with this method in 13 cases has not been encouraging, except for relief of pain and photophobia and influencing favorably the response to atropine, and formation of less conspicuous corneal scars.

M. Davidson.

Katznelson, A. B. Corneal disease due to vitamin B<sub>1</sub> starvation. *Viestnik Oft.*, 1944, v. 23, pt. 1, p. 23.

An outbreak of hypovitaminosis and avitaminosis B<sub>1</sub> was observed in the extreme North under the following circumstances: As the result of a severe snowstorm lasting three days, followed by high humidity, a large group of individuals found themselves isolated, without shelter, with clothes frozen, and compelled to exist principally on biscuit. An outbreak of eye trouble ran a typical course from the beginning of the snowstorm. It began with photophobia, lacrimation, and burning of

both eyes, but with quick recovery of one eye, so that when first observed it was bilateral in only 4 percent. On the second or third day vision often fogged and fell rapidly. Headache and eyeache were complained of by most, but few had colds in the head, cough, or chilliness. Some died suddenly though apparently otherwise well, others following a brief diffuse bronchiolitis and pulmonary emphysema.

The immediate observations by ophthalmologists were of deep cloudiness and marked anesthesia of the corneas without superficial lesions. Observation by the author three weeks later showed three types of lesion: disciform keratitis with only occasional superficial erosion, annular abscess of cornea, and superficial keratitis. The corneal periphery was strikingly transparent in all cases. The uveal tract was involved in one third of the cases. There was hypotension in almost all cases. The iris stood operative intervention well, iridectomy being undertaken early in some. Useful vision was ultimately secured in one half of the cases. General examination indicated a mild B<sub>1</sub> deficiency combined at times with B<sub>2</sub>, B<sub>6</sub>, and C vitamin-deficiency.

The trigeminal was involved in all cases studied neurologically. The sudden deaths are considered vagus deaths, and the pulmonary cases as manifestations of peripheral neuritis in lungs and heart. There was no evidence of vitamin-A deficiency. This "natural experiment" is taken to show that virus infection is not the only etiologic factor in herpetic and disciform keratitis.

M. Davidson.

Nuri Fehmi Ayberk and Sayrun, A. Rosacea keratitis. *Göz Klinigi*, 1945, v. 2, no. 5, pp. 111-115.

The disease, of the nodular type, involved the left eye and also the whole face. The patient, a country woman of 43 years, lived entirely on carbohydrates (insufficiency of riboflavine). She was treated with local application of riboflavine in the eye, 100 grams of brewer's yeast by mouth every day, and unilateral application on the face (leaving the other side as a control) of an ointment containing vitamin B<sub>2</sub>. Healing of the eye and of the treated half of the face was rapid.

W. H. Crisp.

Sergievskaia, L. I. Treatment of corneal ulcers with Albucid. *Viestnik Oft.*, 1944, v. 23, pt. 2, p. 37.

The best results have been observed in marginal ulcers and in those of absolute glaucoma. Progress was stopped, pain disappeared, and there were no recurrences. The criteria used were rapid epithelization and disappearance of hypopyon. Poor results were noted in cases with dacryocystitis and other complications. It is pointed out that corneal disease requires as much study of the organism as a whole as uveal disease does. The report is based on seventy cases.

M. Davidson.

## 7

### UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

García Nocito, P. F., and Zubillaga, J. B. Glassy lines in the anterior chamber. *Arch. de Oft. de Buenos Aires*, 1943, v. 18, May, pp. 266-270.

A patient 16 years old showed a glassy line in the anterior chamber of the right eye consecutive to an old obstetrical injury. On slitlamp examination this line appeared as a filament free in the anterior chamber, and attached by its two ends on the posterior

surface of the cornea, corresponding to the limbus, at the 11 and 5 o'clock positions respectively. The authors review the scanty literature on the subject and accept the pathogenic theory that this formation originates from a fold or tear in Descemet's membrane. (Illustrations, References.)

Plinio Montalván.

Heidelman, J. M. Evaluation of *Toxoplasma* neutralization tests in cases of chorioretinitis. *Arch. of Ophth.*, 1945, v. 34, July, pp. 28-39.

The purpose of this paper is to report the results of a study of the possible diagnostic significance of *Toxoplasma*-neutralizing antibodies in determining the cause of chorioretinitis. *Toxoplasma* is a protozoon of uncertain classification first observed in the North African rodent *gondi* and named by Nicolle and Manceau in 1909. Since then a large number of animal species, including birds, from various parts of the world have been described as natural hosts for this parasite. Animal toxoplasmosis is considered the source of human infection, although the manner of transmission among animals and from animals to man is unknown. The biologic and immunologic relationship between a human strain and an animal strain of *Toxoplasma* has been demonstrated.

The occurrence of human toxoplasmosis was first proved in 1939, when Wolf, Cowen, and Paige demonstrated *Toxoplasmas* at autopsy in the tissues of the central nervous system and the eye of an infant with encephalomyelitis, and transmitted the infection to animals. Fatal cases of toxoplasmic encephalomyelitis, as noted by Wolf and his co-workers, were characterized chiefly by convulsions, internal hydro-

cephalus, cerebral calcification, other neurologic symptoms or signs, and chorioretinitis. The spinal fluid was commonly xanthochromic, with increased protein and mononuclear pleocytosis.

The pathologic changes in the central nervous system, according to the same authors, consisted of areas of inflammation and necrosis, miliary granulomas, hydrocephalus, and calcification. Similar areas of inflammation and necrosis were found in the retina. In the series of 15 cases of toxoplasmic encephalomyelitis reported by Wolfe and his associates, in which the diagnosis was made either clinically or at autopsy, chorioretinitis was present in 10 of the 11 cases in which ophthalmoscopic examination was made. Of 10 patients with chorioretinitis who were studied serologically by Sabin, 9 had neutralizing antibodies.

In the present study, neutralization tests were performed on the serums of 211 persons once or oftener for a total of 269 tests. These serums were obtained from patients with various forms of uveitis or other types of congenital or acquired ocular disease, and from normal persons, including parents of patients with congenital chorioretinitis.

Heidelman obtained strong to moderate neutralization of *Toxoplasma* with the serum of 63 percent of 27 patients with congenital chorioretinitis, 14 percent of 97 patients with anterior or posterior uveitis, and 10 percent of 58 normal persons other than the parents of infants or children with congenital chorioretinitis. Of nine patients with congenital chorioretinitis and other evidence of toxoplasmosis only five had antibodies. Antibodies were present in six of seven mothers of patients with congenital chorioretinitis.

Demonstration of the neutralizing antibody should be considered a factor of moderate diagnostic value only in patients with congenital chorioretinitis. Its absence from serum does not rule out the possibility of toxoplasmic infection.

The neutralizing antibody is of low titer, is thermolabile and shows a tendency to disappear from the blood serum in a few weeks, although it may persist for 15 months or longer, possibly even indefinitely in some cases. Aside from possible instances of familial infection, *Toxoplasma*-neutralizing antibodies may be demonstrated in 10 to 14 percent of persons without clinical manifestations of toxoplasmosis as the disease is at present understood. It is probable that at least in some of these persons the antibodies are non-specific. Detailed tables are given and individual cases analyzed. (8 figures, 12 tables, references.)

R. W. Danielson.

Magder, H. Choroideremia. *Arch. of Ophth.*, 1945, v. 33, June, pp. 468-470.

Choroideremia is a bilateral condition in which the choroid and the pigment layer of the retina disappear. The periphery of the fundus is involved early in the disease and the macula late, so that the early symptoms are usually night blindness and loss of the peripheral visual field.

The author observed choroideremia in a white man aged 58 years who had noticed a gradual decrease in night vision for ten years. The corrected vision of the right eye was 20/20 and of the left 20/30. The visual field was almost identical in the two eyes and consisted of a central visual area of about 5 to 10 degrees and a narrow peripheral field which formed

a complete ring except for the upper part of the field. Both fundi showed a peculiar greenish-white reflex except at the disc, the macula, and the extreme periphery. Except for the macular area and the extreme periphery the choroid appeared to be entirely absent. A few small collections of pigment were scattered throughout the fundi. The various theories as to the causation of choroideremia are discussed. (4 fundus photographs, references.)

John C. Long.

Yegorov, I. G. Histopathologic changes in iris nerves in experimental iritis. *Viestnik Oft.*, 1944, v. 23, pt. 3, p. 37.

The study is based on experimental iritis produced in guinea pigs by application of irritants to the cornea; one eye being cocaineized before application of the irritant in some and 46 hours after the application in others. All had iris lesions. Degenerative changes in the iris nerves were found more marked in the eyes subjected to cocaineization while regenerative hypertrophic changes were more marked in those not cocaineized. Neoformation of bone tissue was noted at the root of the iris and the trabeculum and in the adjacent cornea. The study indicates the reversibility of the process of reactive irritation of nerve fibers in the iris. (Illustrated.)

M. Davidson.

## 8

### GLAUCOMA AND OCULAR TENSION

Gasteiger, H. Vogt's cyclodiathermy puncture. *Klin. M. f. Augenh.*, 1941, v. 107, July, pp. 52-59.

In the eye department of the Rudolf Hess Hospital the author operated upon 18 eyes with different forms of malignant glaucoma which other op-

erations had failed to cure. Good results were had in 15 eyes, failure in three. (2 tables, references.)

F. Nelson.

Kalfa, B. F. Combating ocular hypertension in war injuries. Communication 1. *Viestnik Oft.*, 1944, v. 23, pt. 3, p. 25. (See Section 16, Injuries.)

Kayser, B. The designation of deep excavation of the disc not caused by high tension. *Klin. M. f. Augenh.*, 1941, v. 106, May, p. 600.

The author opposes the designation, introduced by Elschmig, of such cases as "glaucoma without high tension." Cases with deep excavation but without high intraocular tension or other glaucoma symptoms are not glaucomatous but should be classified as cases of "ectasia without high tension."

F. Nelson.

Promtov, V. A. Tonometric study of the effect of prozerin on glaucoma. *Viestnik Oft.*, 1944, v. 23, pt. 2, p. 45.

A 0.5 percent instillation of this Russian drug was found to produce miosis in 18 to 20 minutes and hypotension in one-half to three hours, in 34 cases. In 11 other cases it was ineffective but so were pilocarpine and eserine.

M. Davidson.

Raeva, N. V., and Chaikovskaya, M. J. Intraocular pressure in penetrating cranial wounds. *Viestnik Oft.*, 1944, v. 23, pt. 3, p. 27.

Both before and after operations on the head, the authors observed 45 cases of penetrating skull injuries in which intraocular pressure was noted three times daily. Slight hypertension, asymmetric hypertension, and abnormal daily fluctuations of tension were noted in most of these cases. The changes



were little influenced by operation and were apparently irreversible (at least during the limited period of these observations), and were attended by frontal headaches. Intraocular tonometry should therefore be a part of the routine examination of head injury cases.

M. Davidson.

## 9

## CRYSTALLINE LENS

Kreiker, A. The "contrapunctor" for fixation of the eye in cataract incision. *Klin. M. f. Augenh.*, 1941, v. 107, July, p. 26.

The author feels that none of the various types of fixation forceps gives a firm grip on the eye, since they grasp only the loose conjunctiva bulbi or at best a little bit of episcleral tissue. He has therefore devised a new instrument, the "contrapunctor," which consists of a sharp conical point, 0.75 mm. long, with a stop at its base, where it is 0.5 mm. wide. The instrument is mounted on a conventional handle. The point is inserted into the sclera just outside the limbus and a little below the site of counterpuncture with the Graefe knife. During puncture and counterpuncture, slight pressure is exerted with the instrument. The author believes that the operation can be performed more easily and accurately with this instrument than with fixation forceps.

F. Nelson.

Long, J. C., and Danielson, R. W. Cataract and other congenital defects in infants following rubella in the mother. *Arch. of Ophth.*, 1945, v. 34, July, pp. 24-27.

The authors briefly review the literature and report six cases that they have personally observed. Five of the infections were acquired in Colorado.

In view of the serious nature of the complications noted, various preventive measures have been recommended by different authors, such as deliberate exposure in childhood, convalescent serum, gamma globulin, and therapeutic abortion.

In the six cases reported, the mothers had contracted rubella when from two to six weeks pregnant. Three of the babies had bilateral cataract associated with bilateral microphthalmos. Three of them had unilateral microphthalmos with a distinctive type of cataract in the smaller eye. Fundus lesions were observed in the three eyes of this series in which the fundus could be seen. All six children had cardiac defects. There was one case each of talipes valgus, cryptorchidism, hypospadias, and dacryostenosis. The authors believe that the cataracts, the microphthalmos, the fundus lesions, and the cardiac defects are results of intrauterine damage by rubella. (References.)

R. W. Danielson.

Pflimlin, R. Vitamin B<sub>1</sub> and its clinical significance in ophthalmology. *Klin. M. f. Augenh.*, 1941, v. 106, May, pp. 513-537.

A historic review of the research work done for the past fifty years in investigating the significance of vitamins generally and of the vitamin-B complex in particular. Subjects discussed are: toxicity of vitamins and minimum requirements; reasons why additional vitamins are nowadays more needed than a century ago; concentration of vitamins, especially B<sub>1</sub>, in the regular modern diet; symptomatology of deficiency; biologic and chemical methods in determining the content of vitamin B<sub>1</sub> in different substances and organisms; finally the importance of

vitamin B<sub>1</sub> as treatment in general medicine and in ophthalmology. Not suited for a short review. (4 tables, bibliography.) F. Nelson.

method of choice in intracapsular extraction. F. Nelson.

## 10

## RETINA AND VITREOUS

Rauh, Walter. Rachitic bone changes in the supposedly "purely tetanic" nutritional cataract. *Klin. M. f. Augenh.*, 1941, v. 107, July, pp. 59-67.

According to Bietti, rats on a low calcium and high phosphorus diet, lacking vitamin D, developed tetany with cataract but no rickets. In contrast to Bietti's findings, all of Rauh's animals, as far as they were examined histologically, showed definitely rachitic changes in addition to the cataracts and tetanic symptoms. (10 illustrations, references.) F. Nelson.

Szinegh, Béla. Advantages and disadvantages of the round pupil in contrast to iridectomy in intracapsular cataract operation. *Klin. M. f. Augenh.*, 1941, v. 107, July, p. 19.

Two hundred intracapsular cataract operations with iridectomy are compared with an equal number of operations with basal iris-excision. Of those cases with round pupil, complications such as iris prolapse, iritis, and incarceration of iris in the wound occurred in 8 percent more than in the iridectomy cases and made additional operative procedure during the healing period necessary in 5 percent. The end result was however not influenced to any extent. However, such cases required prolonged hospitalization and caused additional anxiety and care. On the other hand, the average visual acuity with round pupil was found a little better, and the cosmetic effect more agreeable. Generally speaking, operation with round pupil and basal excision must be regarded as the

Lobeck, E. Errors in localizing retinal tears and how to avoid them in operations for retinal detachment. *Klin. M. f. Augenh.*, 1941, v. 107, July, pp. 36-52.

The author devised a trigonometric scheme for localization of retinal holes to correct for ophthalmoscopic distortion of the opening when the detachment is "high," taking into consideration the necessary mathematic correction of the eye's objective refraction and using the fixed distance between the ora serrata and the limbus (8 mm. at temporal, 7 mm. at nasal side) as well as the more or less constant attachment of the recti and oblique muscles as guides. The latter aid in localization is especially important in operation for macular hole. The horizontal distance between the macula and the rear end of the scleral attachment of the inferior oblique is 4 mm. (1 drawing, 1 table.)

F. Nelson.

Rieken, H. Objective adaptometry. *Klin. M. f. Augenh.*, 1941, v. 107, July, p. 1.

In order to eliminate malinger and other psychologic factors in examination of dark adaptation, the author has developed a method for determining adaptation objectively, using optokinetic nystagmus, which is an objective reagent to irritability of the visual apparatus. The fact that not only the cones but also the rods respond to optokinetic stimuli is particularly important, since in dark adaptation the rods play the predominant role. Techni-

cally, optokinetic nystagmus can be registered in several different ways. It is only important to register the start and the cessation of nystagmus, corresponding with appearance and disappearance of the effective light stimulus. F. Nelson.

Rucker, C. W. Sheathing of the retinal veins in multiple sclerosis. *Jour. Amer. Med. Assoc.*, 1945, v. 127, April 14, p. 970. (See *Amer. Jour. Ophth.*, 1944, v. 27, Oct., p. 1188.)

Sverdlick, José. Some observations concerning the structure of the retinal cells. *Arch. de Oft. de Buenos Aires*, 1943, v. 18, June, pp. 288-298. (See *Amer. Jour. Ophth.*, 1943, v. 26, Dec., p. 1349.)

Von Sallmann, Ludwig. Penicillin therapy of infections of the vitreous. *Arch. of Ophth.*, 1945, v. 33, June, pp. 455-462.

Intravitreal injections of 100 or 10 Oxford units of commercial sodium penicillin in the rabbit eye failed to cause any noticeable damage to the retina, lens, or optic nerve. The lesions caused by 500 units were negligible. Experimental staphylococcic infections in the rabbit vitreous were checked by intravitreal injection of 10 Oxford units of sodium penicillin eight hours after inoculation. The therapeutic effect was increased when 50 to 400 units were used. Traction folds of the retina developed in a number of the beneficially treated eyes, from shrinking strands of organized exudate.

Pneumococcic infections of the vitreous were arrested in the rabbit eye by intravitreal injection of 100 Oxford units of sodium penicillin eight hours after inoculation. The use of 5 Oxford

units was often unsatisfactory. Subconjunctival injection of 250 Oxford units of penicillin after intravitreal injection of pneumococci failed to influence the course of the infection.

Three human eyes with severe traumatic endophthalmitis involving the vitreous space were treated by intravitreal injection of penicillin along with application of the drug by iontophoresis. Two of these patients responded favorably despite the advanced stage of the infection and the lapse of more than 48 hours between onset of the infection and the first intravitreal treatment. (3 tables, references.)

John C. Long.

## 11

### OPTIC NERVE AND TOXIC AMBLYOPIAS

/Bhaduri, B. N. Hereditary optic atrophy. *Calcutta Med. Jour.*, 1945, v. 42, Jan., p. 1.

The author reports two cases of the disease in brothers, one 16, the other 18 years of age. Along with the clinical and laboratory reports, the Wassermann being negative, are given the perimetric studies and notes on an associated deafness in these cases. The visual and aural troubles came on at puberty in both cases. The historic background of the disease and the hereditary aspect of these cases are discussed. Francis M. Crage.

## 12

### VISUAL TRACTS AND CENTERS

Birge, H. L. Ocular war neuroses. *Arch. of Ophth.*, 1945, v. 33, June, pp. 440-448.

The importance of psychologic tension in producing syndromes resembling organic disease has become in-

creasingly obvious during war. Ocular neuroses form a rather insignificant group of war neuroses, but they are of importance to the ophthalmologist. War neuroses are not so dependent on abnormal psychic background as are civilian neuroses. The ocular neuroses are not usually disabling. They are often associated with insomnia. Symptoms may include ocular pain, headache, twitching eyelids, spots before the eyes, burning of the eyes, epiphora, photophobia, and occasional distortion of perspective. The dividing line between neuroses and psychosomatic states is not a straight and narrow one. Cases are classified in the latter group when there is evidence of psychoneurosis (frequently an anxiety state) and ophthalmic abnormality on examination.

None of the patients can be treated until after careful and complete ophthalmic examination has been carried out. There can be no routine simplified form of treatment. For patients with the anxiety type of neurosis but normal ocular findings the treatment is one of reassurance by the ophthalmologist. Persistent and recurrent symptoms call for treatment by a psychiatrist. The treatment of hysteria and of the obsessive state is also carried out by the psychiatrist. (1 color-field chart.)

John C. Long.

Bulach. The ophthalmoplegic syndrome in bulbar encephalitis. *Viestnik Oft.*, 1944, v. 23, pt. 2, p. 28.

The author records six cases of an unusual and mostly fatal bulbar encephalitis observed in six soldiers wounded in different parts of the body, without any wound complications, and feeling well for days. The course was rapid. Five died in two to ten days, and

one recovered. The eye findings were complete ophthalmoplegia and normal fundi and visual acuity. It is believed with Margulis that the virus is concentrated in the basal cistern and thus affects the oculomotor nerves first and foremost.

M. Davidson.

### 13

#### EYEBALL AND ORBIT

Filatov, V. P. Optical correction of a disfiguring prothesis and of unequal size of the eyes. *Viestnik Oft.*, 1944, v. 23, pt. 3, p. 3.

When a cosmetically satisfactory prothesis cannot be obtained, resort may be had to optical means of overcoming the disfigurement. Convex and concave spheres, cylinders, and prisms, or combinations of them, aid considerably in reducing it. A plus or minus sphere of 8 to 12 D. takes care of a too small and sunken prothesis, or of excessive size and prominence. The other eye is given a plano lens or its needed correction. Cylinders are available for changing the width of the palpebral fissure, a convex cylinder axis horizontal widening it and a minus cylinder axis horizontal narrowing it. The apparent length of the fissure can be affected by cylinder axis vertical. Special grinding of the lens can help in overcoming too deep a prothesis and palpebral folds. The grinding does not have to be as precise as in the ordinary bifocal and trifocal lenses. Varying size of lenses and the use of smoked lenses may also be utilized. The same procedure may be used in blind eyes with disfigurement, such as microphthalmic and buphthalmic eyes; and also to obviate a purely cosmetic surgical procedure.

M. Davidson.

Gukasian, M. G. A rare case of enophthalmos and symblepharon simulating anophthalmos. *Viestnik Oft.*, 1944, v. 23, pt. 2, p. 35.

In this case the transition folds were so adherent that an operation for restoring a contracted socket was undertaken; and it was then that the presence of the complete globe was discovered. The fundus was normal and vision was good after correction. M. Davidson.

Kirby, D. B. Enucleation of the eyeball. *Arch. of Ophth.*, 1945, v. 34, July, pp. 1-6. (See *Amer. Jour. Ophth.*, 1945, v. 28, Sept., p. 1054.)

Long, J. C., and Danielson, R. W. Cataract and other congenital defects in infants following rubella in the mother. *Arch. of Ophth.*, 1945, v. 34, July, pp. 24-27. (See Section 9, Crystalline lens.)

Pokrovsky, A. I. Some remarks on transplantation of tissue into Tenon's capsule after enucleation. *Viestnik Oft.*, 1944, v. 23, pt. 2, p. 6.

Medvedev's method of implantation of sclera results in a mobile stump, particularly if modified to use more than one half of the sclera to provide for subsequent contraction of the stump. Attention is however called to the possible danger of sympathetic ophthalmia in view of the difficulty of removing all islands of uveal tissue clinging to the sclera and of the fact that the sclera itself may contain infiltrates with giant cells, such as have been reported in cases of sympathetic ophthalmia. The author therefore prefers Orlov's method of implanting a skin-and-fat flap. No tendency to necrosis has been noted in using the dermal flap. Suturing the muscles to it, as Medvedev does to the

sclera, might improve Orlov's method further. M. Davidson.

Tovbin, L. G. A two-stage method for plastic restoration of the fornices. *Viestnik Oft.*, 1944, v. 23, pt. 3, p. 30.

In order to prevent interference from hemorrhage during operation, and subsequent contraction of the restored socket, the author first makes the necessary incisions, packs the cavity for three days, and then proceeds with the transplantation. This procedure has given better results than the one-phase operation. M. Davidson.

#### 14

#### EYELIDS AND LACRIMAL APPARATUS

Babudieri, B., and Bietti, C. B. Electron microscopic observations on bacteriolysis produced by lysozyme of tears. *Arch. of Ophth.*, 1945, v. 33, June, pp. 449-454. (See Section 2, Therapeutics and operation.)

Laval, Joseph. A modified sling operation for correction of ptosis. *Arch. of Ophth.*, 1945, v. 33, June, pp. 482-483.

The author suggests a modification of the Reese operation using strips of orbicularis muscle and pretarsal fascia as a lid sling. A strip of orbicularis muscle is isolated just above the upper tarsal margin. This strip is divided in the middle, without damaging the nasal and temporal attachments. The ends of the strips are then carried straight upward and anchored to the periosteum. This procedure is recommended in cases in which the levator and the superior rectus muscles are completely paralyzed. (3 drawings, 2 photographs, references.) John C. Long.

Pokrovsky, K. I. Theoretical and practical problems of tissue transplan-

tation in plastic operations. *Viestnik Oft.*, 1944, v. 23, pt. 1, p. 3.

In a transplant only a peripheral zone retains its vitality. An intermediate zone partly degenerates, and the central zone wholly degenerates. Regeneration is effected by the surviving elements of the transplant, some elements of the receiving bed, and wandering elements from a distance. The leading role in the process is played by the penetration of newly formed vessels. The process reacts also on the surrounding tissue. The biochemical therapeutic effect of the transplant has been noted by Filatov. It finds its application in trachoma and in the Denig operation. Degenerated fat cells in fat implants are replaced by new fat cells. Scar tissue becomes absorbed in course of time and acquires mobility with the formation of areolar tissue. Pedicled transplants are of course less subject to degenerative changes than free transplants. In the latter, however, these changes can be minimized by proper technique and attention to the following: adequate removal of old scar tissue; satisfactory hemostasis to prevent accumulation of too much blood behind the transplant; avoidance of transplanting into inflamed tissue; avoidance of traumatization of transplant; and avoidance of too liberal size of transplant, which must not exceed 3 by 5 cm.; care in apposition of edges and avoidance of traction. The writer has never observed complete necrosis after free flap implantation under the skin, and warmly recommends it.

M. Davidson.

## 15

### TUMORS

Csapody, István. Choroidal tumor operated on with diathermy puncture.

*Klin. M. f. Augenh.*, 1941, v. 107, July, p. 28.

Though the safest procedure in every case where a malignant melanoma of the uveal tract is found is early enucleation before flooding of the organism with tumor cells sets in, it might be justifiable in certain cases to try to destroy such tumors with diathermy and subsequent perforating cautery where the tumor is still very small. The author reports a very small malignant melanoma directly in the macula. (3 colored fundus pictures.)

F. Nelson.

Felkel, R. K., and Glowatzky, F. Case of congenital round-cell sarcoma of the orbit. *Klin. M. f. Augenh.*, 1941, v. 106, May, pp. 582-585.

A baby was born with extreme unilateral proptosis bulbi. A round-cell sarcoma filled the whole orbit. Keratitis from lagophthalmos developed. The tumor grew rapidly. The patient died seven weeks after birth. At post mortem, invasion by the tumor through the ethmoid cells into the frontal lobe was found. There was metastasis into the heart. Only four such cases have previously been reported. (4 illustrations, references.)

F. Nelson.

Glowatzky, Franz. Orbitography in a case of retrobulbar tumor. *Klin. M. f. Augenh.*, 1941, v. 106, May, pp. 575-582.

A case of orbital tumor (Hippel's gliomatosis) in which for diagnostic reasons a retrobulbar injection with 6 c.c. of thorostrast was made. Nausea and vomiting followed two hours later. All of the injected material rather rapidly infiltrated the lids and the subconjunctival space, none remaining in the orbit. The tumor was removed by

Krönlein operation, with resection of the optic nerve. Ptosis resulted. The subconjunctival and subcutaneous deposits of thorotrast made a plastic operation necessary. Thiel's orbitography with thorotrast is apparently not applicable where a tumor fills the whole orbit. (6 illustrations, references.)

F. Nelson.

Martin, H., and Reese, A. B. Treatment of bilateral retinoblastoma (retinal glioma) surgically and by irradiation. *Arch. of Ophth.*, 1945, v. 33, June, pp. 429-439.

Removal of the eye with the more advanced involvement is combined with the irradiation of the posterior half of the other eye by a special technique. Twenty-four cases of bilateral retinoblastoma have been treated in this manner. Up to 1939, nine cases had been treated, with the following five-year end results: two deaths due to retinoblastoma; one death from rhabdomyosarcoma arising in the temporal muscle eight years after treatment for retinoblastoma (patient had good vision in treated eye for over seven years); two patients living without recurrence and with vision; four patients living without recurrence but blind. Of 14 patients treated during the last five years, three have died or have recurrences, three are blind but appear to be free of disease, and eight have vision and are free of tumor.

Retinoblastoma is a fairly radiosensitive tumor and could be easily destroyed were it not for the fact that the ciliary body, iris, and lens are also very radiosensitive. The anterior segment of the eye is so radiosensitive that the eye would be destroyed by even a part of the dose necessary to destroy the retinoblastoma. Very exact tech-

nique has been evolved to permit the treatment of the posterior segment only. Two special cylinders have been designed to permit application of X ray through a temporal portal and through an oblique portal from the opposite side of the bridge of the nose. Treatment is given in divided doses three times a week for several months until a total of 8,000 r x 2 has been administered.

Retinoblastoma is always a congenital tumor and the authors state that it is bilateral in the majority of instances. They stress the importance of a detailed examination of both eyes under general anesthesia and ideal conditions in all suspected cases. Early diagnosis and treatment are important. The prognosis is not favorable if the tumor occupies more than one quadrant of the fundus. Tumors that have invaded the choroid are uncontrollable by radiation and require enucleation. Complications of irradiation have included glaucoma, cataract, phthisis bulbi, and late vascular changes. These complications can be avoided only by rigid attention to technique. (2 tables, 4 figures.)

John C. Long.

Schöpfer. Lymphangioma cavernosum of conjunctiva and buccal mucous membrane. *Klin. M. f. Augenh.*, 1941, v. 106, May, pp. 592-595.

A rare case of multiple lymphangioma in the conjunctiva and in the mucous membrane of the cheek and palate, in a 23-year-old male. The diagnosis could be established clinically without doubt, because of the typical appearance of the tumors. Biopsy was unnecessary and would have been inadvisable because of poor healing tendency after excision. (3 illustrations, references.)

F. Nelson.

Travi, O. C., and Sidelnick, A. E. Bothriomycoma of the conjunctiva. Arch. de Oft. de Buenos Aires, 1943, v. 18, May, pp. 238-244.

A woman 62 years old presented a small pediculated tumor of the conjunctiva at the outer canthus. The tumor was fleshy and grayish-white in color, having appeared 15 days prior to the first examination. Four months after its removal the lesion recurred, showing all the characteristics of the original tumor. The histopathologic diagnosis was telangiectatic granuloma, characterized by newly-formed vascular spaces lined with endothelium, with a stroma formed by embryonic connective tissue infiltrated by inflammatory cells. Due to its similarity to the lesions of bothriomyces in the horse, this type of tumor has received the name of bothriomycoma, which is a misnomer because the growth is a cutaneous granuloma produced by a microorganism similar to the staphylococcus aureus. The condition is extremely rare in the eye, only two cases having been previously reported in the literature. A brief description of the disease is presented. (5 illustrations, including 3 photomicrographs, bibliography.)

Plinio Montalván.

## 16

### INJURIES

Archangelsky, P. F. Corneal trephining for access to the anterior chamber in eye injuries. Viestnik Oft., 1944, v. 23, pt. 2, p. 23.

In ten cases the trephine was used in removal of nonmagnetic foreign bodies from the anterior chamber, iris, or lens. The method has also been found useful for removal of cataract in absence of anterior chamber.

M. Davidson.

Baltin, M. M. The mechanism of secondary optic-nerve changes in orbital war-injuries. Viestnik Oft., 1944, v. 23, pt. 1, p. 9.

The thesis of Popov that external orbital-wall injuries are most frequently responsible for fissures of the optic foramina, and that the optic-nerve lesions are reflex in nature, is discussed, and it is pointed out that it is usually the orbital-roof fissures that lead to the optic foramen indirectly, and that fractures of the outer orbital wall and of the zygoma, for reasons of topographic anatomy, rarely give rise to indirect fractures of the optic foramina. The interposition of the sphenoidal fissure and the sutures connecting the zygoma with the other bones entering into the formation of the orbit prevent involvement of the foramina. Optic-foramina fractures, as found by X rays, take part in basal fractures, the roof of the orbit being a part of the base of the skull. The characteristics of an optic-foramen fracture are: immediate loss of vision, loss of direct pupillary reaction, and normal fundus at first but paleness of the optic nerve-head a week later. Popov's cases are not characteristic enough to justify his thesis. Only rarely is hyperemia of disc observed. There is no inflammatory reaction, and no callus has been observed by the writer in the optic canal. X-raying the optic foramen is very difficult. The Reese method is not accurate. Greater precision is achieved by the Baltin method described elsewhere. An X ray of the optic foramen alone without an X ray of the base of the skull is not sufficient.

M. Davidson.

Bochever, E. M. Nonmagnetic foreign bodies in the eye. Viestnik Oft. 1944, v. 23, pt. 2, p. 25.



The author's experience leads him to the conclusion that when these are in the posterior segment they are better left alone. Successful extraction of two led later to enucleation, while two other cases in which they were left alone fared better. Multiple foreign bodies in the cornea are also best left alone unless superficial. Glass foreign bodies tend to extrude themselves. Removal is favored when they are in the anterior chamber or iris. When in the lens they should be removed together with the lens. M. Davidson.

Braunstein, N. E. The therapy of war injuries of the eyes. *Viestnik Oft.*, 1944, v. 23, pt. 1, p. 13.

Two years experience in the treatment of perforating eye injuries reaching base hospitals two weeks to several months after injury, indicates need for revision of our theory of the traumatic process in the eye, and of our therapeutic practices. During the first two years of the war, in the absence of uniform instructions for the treatment of eye injuries, and of an adequate supply of drugs, treatment at the evacuation hospitals lacked standards, had no clear objectives, and was often limited to first aid and subsequent trust in nature.

Our old concept of the role of exogenous infection in traumatic inflammations of the eye is no longer tenable. We must recognize a reactive, or aseptic, or regenerative inflammation in wounds beyond the already recognized processes in the case of copper and other metals. Even in the presence of microbes, some uveitises represent an aseptic inflammatory process conditioned by local or general allergy, the presence of protein products, trophic disturbances, disturbed circulation of

fluids, and disturbed topographic anatomy of the eye. In many cases bacteriology is negative. Limitation of the inflammation to the eye without involvement of any other part of the body argues against the process being an infection. Its chronicity also argues to a like effect. Of a hundred eyes enucleated after war injuries, and studied by the writer, the presence of an infection was established in only 16. Evidence of sympathetic ophthalmia was found in only three additional cases. In 81 there was no evidence of purulent infection. These aseptic cases lead to blindness not because of infection but because of accelerated processes of pathologic organization, namely adhesions and cicatricial bands and their contractions. The author therefore proposes to recognize three morphologically distinct types of inflammation in eye injuries:

(1) A reactive aseptic uveitis characterized by exudation, and strictly localized in the uveal tract without involvement of vitreous and retina. The tendency toward organization is marked. (2) Sympathetic inflammation of a proliferative character, with formation of foci of the type of infectious granuloma, having specific cellular elements (epithelioid and giant cells). It is possible that here we deal with endogenous factors, namely sensitivity to specific allergens. (3) Infectious purulent-exudative inflammation, or purulent endophthalmitis, localized in the ocular cavity and retina and not involving the choroid. The cellular elements are pus cells. Active therapy consisting in removal of all crushed tissues, careful closure of wounds, and early removal of intraocular foreign bodies is primarily indicated.

M. Davidson.

Dashevskii, A. I. Formation of the inner layer in a one-stage lid reconstruction for complete or partial absence and anophthalmos. *Viestnik Oft.*, 1944, v. 23, pt. 1, p. 6.

The problem of creating a new socket and rebuilding a new lid, either upper or lower, can be solved in a one-stage operation, without recourse to free grafting, by utilization of locally available tissue in the form of skin and conjunctiva fused together. The first step consists in outlining enough of the mass to provide for the inner layer of the lid and restoration of the socket. This is undermined as far inward as possible, almost to the center of the conjunctival sac. The previously selected prosthesis is put in as a guide in determining the site of the fornix, either upper or lower, and through this two mattress sutures are inserted, to emerge either 5 to 6 mm. below the original incision (for the lower) or under the eyebrow (for the upper lid). The prosthesis is again put in, and is given the right position by adjusting the sutures. The sutures are tied at the end of the operation. Next a Fricke flap is prepared to take care of the defect and formation of the outer layer of the lid. This must be twice the width of the flap for the inner layer. The outer and inner layers are sutured, beginning internally to form the lid border. The place of the Fricke flap is closed by subcutaneous sutures. The mattress sutures are now tied under guidance by the position of the prosthesis. The stability of the inner layer was demonstrated in a case in which unfortunately the outer layer was lost from an accident three days after the operation. The cosmetic effect includes a deep socket with well formed fornices. (Illustrated.)

M. Davidson.

Drinker, Philip. Measurement and prevention of eye flash. *Sight-Saving Review*, 1944, v. 14, p. 166.

The author's investigations refer to ultraviolet light such as that to which workers in welding, cutting, burning, and even shrinking are exposed. Brief references are made to protective glasses used, distance and exposure, and lightmeter measurements. Real evidence of eye burn in unprotected eyes exposed to typical shipyard welding-arcs came after 80 minutes at 100 feet. No evidence of burn was present before 20 minutes at 50 feet.

The screening effect of ordinary glass on ultraviolet, in all types of eyeglasses and safety glasses, is so good that eye flash is virtually nonexistent among wearers of glasses. Hardened-lens safety goggles with side eyeshields are considered adequate protection for most shipyard workers. All goggles worn near welding operations should be equipped with side guards for protection against foreign bodies.

Francis M. Crage.

Fanta, H. Contribution to clinical picture of traumatic detachment of the vitreous body. *Klin. M. f. Augenh.*, 1941, v. 107, July, p. 80.

Report of two cases of traumatic detachment of the vitreous body, one caused by indirect trauma (motorcycle accident), the other by direct trauma (eye hit by piece of wood). Such cases are always predisposed to retinal detachment.

F. Nelson.

Gálvez Bunge and Moraschi. Intraocular foreign bodies. *Arch. de Oft. de Buenos Aires*, 1943, v. 18, May, pp. 271-274.

The authors report three cases. Two of the foreign bodies were nonmagnetic.

The three had been observed 1, 2, and 17 years respectively after the injury, without any evidence of uveal reaction or intraocular inflammation. In view of the tolerance shown by these eyes the authors do not advocate surgical interference in recent cases of nonmagnetic foreign body or in any case in which the time elapsed after the injury is long, the vision is good, and there is no evidence of intraocular inflammation. (Illustrated.)

Plinio Montalván.

Goldenberg, A. Z. The treatment of eye burns with Albucid. *Viestnik Oft.*, 1944, v. 23, pt. 1, p. 42.

Very encouraging results are reported from use of a 30-percent Albucid ointment in 45 cases (half of them severe) including chemical and thermal burns and one due to an explosion.

M. Davidson.

Kalfa, S. F. Combating ocular hypertension in war injuries. Communication I. *Viestnik Oft.*, 1944, v. 23, pt. 3, p. 25.

The role of vasomotor innervation in the pathogenesis of traumatic hypertension is discussed. As a reaction to injury the tension rises after one or two minutes and reaches its maximum in 15 to 20 minutes. With perforating injuries this phenomenon does not manifest itself until after closure of the wound. Pain is not a paramount factor in this reactive hypertony, since it follows corneal much less than iris injuries. Two phases may be distinguished; an active hyperemia first and a passive hyperemia later. This reactive hypertension may be controlled by blocking the local autonomic nervous system. Prevention of hypertension may be achieved by use of cocaine locally in contused eyes. Its control

requires retrobulbar injections of novocaine. Interference with circulation and permanent lowering of visual acuity, without visible anatomic change in the fundus, may be observed after four hours of hypertension and is inevitable after 24 hours of it. M. Davidson.

Katznelson, A. V. Gunshot injuries of the lids and handling in the field and front stations. *Viestnik Oft.*, 1944, v. 23, pt. 2, p. 7.

In a review summary of the handling of these injuries it is emphasized that every lid wound may be accompanied by more serious deeper lesions in orbit and sinuses and cranial cavity, and that these lesions may be overlooked if the cases are not carefully examined.

M. Davidson.

Klachko, M. L. The eye findings in gunshot basal skull fractures. *Viestnik Oft.*, 1944, v. 23, pt. 2, p. 13.

The enormous majority of basal fractures succumb at the front, and few reach base hospitals. Of the 935 cases of craniocerebral injury reaching base hospitals only 16 were diagnosed as such and four verified at autopsy. Most of these resulted from temporal, frontal, maxillary and orbital injuries. The weakest spot is the roof of the orbit. A hematoma of lids, sclera, and orbit indicates an anterior fossa fracture; hematoma of nose, ear, mouth, and pharynx points to fracture of the middle fossa; that of the tip of the mastoid indicates a posterior fossa fracture. Macewen's sign of mydriasis on the side of the hemorrhage has been helpful. But on the whole the topical diagnostic value of the preceding signs, including cranial-nerve involvement, is relative. The only absolute sign is escape of cerebral contents. Involvement

of the optic nerve acquires more value in the light of this war's experience, but the author does not believe the diagnosis of a basal fracture can be made from ocular findings alone.

M. Davidson.

Kolychev, N. Lead as intraocular foreign body in war injuries. *Viestnik Oft.*, 1944, v. 23, pt. 1, p. 31.

In the last war 3.3-percent of all intraocular foreign bodies were lead, according to Fleischer. Observation of two such cases in this war indicates their innocuousness. The diagnosis was facilitated by careful slitlamp examination, which showed a scattered white powdery substance in lids and globe. This was due to the fact that the lead bullets had hit something hard first and had broken up into minute particles which became further pulverized on striking the lids and globe and on penetration of the eyeball. M. Davidson.

Krasnov, M. L. Diascleral extraction of nonmagnetic foreign bodies from the eye. *Viestnik Oft.*, 1944, v. 23, pt. 3, p. 17.

The author has operated on five cases of intraocular copper, and has removed four foreign bodies. Scleral section in four cases was opposite the pars plana.

M. Davidson.

Krol, A. G. Enucleation in war eye injuries. *Viestnik Oft.*, 1944, v. 23, pt. 2, p. 31.

Having observed many infections after enucleations at the front, the author advocates dispensing with conjunctival sutures in such circumstances. The editor however remarks that in base hospitals suturing is more rational.

M. Davidson.

Krol, A. G. Tips for extraction of foreign bodies with the giant electro-magnet by the posterior route. *Viestnik Oft.*, 1944, v. 23, pt. 3, p. 45.

Three tips are described which are screwed into regular tip for this purpose. The pull is decreased somewhat, but this is overcome by previous magnetization of the foreign body with the regular tip, and by the closer approach afforded to it.

M. Davidson.

Poliak, B. L., and Chutko, M. B. Magnet extractions at the front. *Viestnik Oft.*, 1944, v. 23, pt. 3, p. 8.

Magnet operations are an important function of the military surgeon. In the recent war 55 to 70 percent of all eye injuries were perforating, with 25 to 30 percent harboring intraocular foreign bodies of which two thirds were magnetic. Provision should be made for a possible breakdown of the giant magnet, by providing stations close to the front with hand magnets. To meet such emergencies several ophthalmologists themselves built such magnets, powered by storage batteries and dry cells. Golovin extracted 122 out of 144 foreign bodies with his, and others have extracted 90 to 94 percent of foreign bodies with hand magnets. Constant magnets have not given good results. In the matter of therapy the anterior route has no place in war injuries, since the particles are small, twisted, and mainly in the posterior segment. Use of the anterior route is limited to foreign bodies in the anterior chamber, iris, and lens.

M. Davidson.

Radzikhovskii, B. L. A new X-ray geometric method for differential diagnosis and localization of intraocular foreign bodies. *Viestnik Oft.*, 1944, v. 23, pt. 1, p. 19.

The indicator employed is an aluminum four-branch prosthesis, forming a hemisphere of 24-mm. radius, provided with lead markers, one at the pole, one in the center, and one at each end of the branches. The prosthesis is fixed to the globe by an adjustable head-strap. Antero-posterior and lateral views are taken, using special means for fixation. For the monocular patient a hole in the prosthesis near the pole provides for fixation. (Illustrated.) M. Davidson.

Raeva, N. V., and Chaikovskaya, M. J. Intraocular pressure in penetrating cranial wounds. *Viestnik Oft.*, 1944, v. 23, pt. 3, p. 27. (See Section 8, Glaucoma and ocular tension.)

Rodigina, A. M. Principles underlying treatment of the war-blind. *Viestnik Oft.*, 1944, v. 23, pt. 3, p. 4.

The treatment of the war-blind needs revision in the light of experience indicating the possibility of saving apparently hopeless eyes by persistence. Sixty percent of all eye injuries are perforating injuries and are complicated by iridocyclitis. In the first phase of the iridocyclitis, lasting about a month, practically nothing can be done except to use mydriatics and analgesics and to keep the wound clean. During the second phase, lasting 2 or 3 months, hypertension may have to be met as an emergency but nothing more can be done. After this the eye is quiet and some vision may return. In this stage osmotherapy, or hypertonic solutions—principally salt and at times glucose—combined with dry heat locally have been found to promote absorption of exudates and to reduce inflammation very markedly. What can be achieved is illustrated by two cases. One patient was a one-eyed blind soldier in whom

the intensive work resulted in vision of 20/300 and return to work. The other was a blind soldier in whom 20/70 and 20/50 were secured.

M. Davidson.

Rosenblum, M. E. The removal of nonmagnetic foreign bodies from the posterior segment. *Viestnik Oft.*, 1944, v. 23, pt. 3, p. 12.

Already before the war the incidence of nonmagnetic foreign bodies in the eye had considerably increased. In war injuries their incidence is between 35 and 40 percent. Most of them are of copper, and the author is unqualifiedly in favor of their removal. He makes a preliminary diathermocoagulation for more precise localization when the foreign body is visible ophthalmoscopically. The magnet is applied, to make sure of the foreign body being nonmagnetic. The choroid is not cut but is carefully opened up with a spatula. Fifteen cases are reported, with nine successful removals. No case was made worse by the attempt. M. Davidson.

Shershevskaja, O. I. Retinal-vessel reactions in cranial war injuries. *Viestnik Oft.*, 1944, v. 23, pt. 2, p. 16.

On the basis of 610 cases of cranial injury observed, the author believes with Margulis-Kolen that the retinal vessels reflect both closed and open injuries. Aside from papilledema there have been observed widening of veins and abnormal venous reflexes, capillary hyperemia of the disc without blurring of margins, at times narrowing of arteries, widening of their reflex, arterio-venous compression, irregular caliber of veins, tortuosity of macular veins, mild peripapillary edema, increased branching of vascular network, occasional white streaks along vessels, and

hemorrhages. The findings are, in other words, those of the fundus in the hypertensive patient. They have been observed 2 or 3 months up to a year after injury, in remote base hospitals. No case of neuritis or of central vein thrombosis was observed. Blood pressure was normal in all. Among the visual-field changes were absolute and relative central scotomata and peripheral concentric contractions. Occasionally, faint macular pigment changes were noted. Dynamometric studies of the retinal vessels are now in progress on these cases. In conclusion, the author notes that the fundus changes are similar to those of the hypertonic fundus, that these reflect the vasomotor reactions of the cerebral vessels to injury, that retinal hypertony need not be accompanied by general vascular hypertony, but runs parallel with intracranial hypertension, and that these changes persist longer than other signs of cerebral injury and are therefore important aids in retrospective diagnosis of such injuries.

M. Davidson.

Smelanskii, R. I., and Treister, G. N. Clinical and X ray features of gunshot injuries of the orbit. *Viestnik Oft.*, 1944, v. 23, pt. 2, p. 32.

The orbit, in which neurosurgeons, ophthalmologists, and rhinologists are all interested, tends to become clinically a No-Man's land. The topography of the orbit is also unfavorable for the radiologist. Hence special techniques are necessary in its X-ray exploration. The "kiss position" is considered the only adequate one, and the frontonasal position is rejected as unsatisfactory. In addition to a lateral view, use of the narrow tube is necessary for special details. At the writers' neurosurgical

service, handling stretcher cases exclusively, 500 cases, constituting 40.2 percent of all eye-injury cases, were found by X ray to have orbital fractures. These orbital fractures constituted 24.6 percent of all skull fractures found, and 90 percent of them were combined and involved neighboring cavities, and 2.5 percent were bilateral. The majority were fractures of the lower outer orbital wall. Almost all cases showed diastasis of the frontomalar sutures, at times with considerable separation and displacement of fragments. The most difficult wall to X-ray is the inner orbital wall, and while only 6.9 percent showed lamina-papyracea fracture, clinically there were more of them. Few optic-foramen fractures were observed, and this is explained by the supposition that the optic foramen is more often involved indirectly than in direct orbital injury. Because of the seriousness of these orbital injuries it is advocated that they be concentrated in special sections where they may have the benefit of team work by ophthalmologist, neurosurgeon, rhinologist, and stomatologist.

M. Davidson.

Strakov, V. P., and Bochever, E. M. Eye contusions in orbital gunshot wounds. *Viestnik Oft.*, 1944, v. 23, pt. 2, p. 3.

The authors believe that many of the changes in the globe can be explained on the basis of disturbance of the autonomic innervation, with vessel spasm, subsequent increased permeability of vessels, disturbed secretion, and lowered intraocular pressure. A review of 300 cases of orbital injury with globe apparently uninjured showed 43.3 percent of combined orbital fractures, and 40 percent of foreign body in the orbit. In 30 percent the fundi showed Berlin's

edema lasting three to four days but disappearing without a trace. There were 4 percent with retinal detachment. Vitreous hemorrhages seemed to be mainly associated with zygomatic fractures, this being explained by the greater force required to produce them. Many cases suffered loss of vision without any lesions in the fundi, and 70 percent of the cases retained less than 20/200 visual acuity. Many of them were accompanied by evidence of craniocerebral trauma, and it is emphasized that all orbital injuries should be handled and treated as such and not as if they were merely local and isolated cases of injury. M. Davidson

Tikhomirov, P. E. The peculiarities of intraocular foreign bodies in the present war and their proper handling. *Viestnik Oft.*, 1944, v. 23, pt. 2, p. 10.

Sixteen percent of all perforating eye injuries have intraocular foreign bodies, and 70 percent of all eye injuries are perforating injuries. Many of the injuries result in multiple foreign bodies while 67 percent are in the posterior segment; 21 percent in the ciliary body; 10 percent in the anterior chamber, iris and lens; 2 percent are double perforations; 75 percent are in the lower hemisphere, 13 percent in the upper and 12 percent in the horizontal meridian. Most of the foreign bodies are small, the largest being 10 mm. The injuries with the larger foreign bodies cause loss of the eye and do not reach the base hospitals. 26 percent of them are nonmagnetic. In addition, 23 percent could not be extracted and were presumed to be nonmagnetic. Of those eyes from which foreign bodies were extracted 11 percent later had to be enucleated. The author believes that nonmagnetic foreign bodies are better

left alone, since the end results of their extraction are still not known. He is also in favor of not attempting extraction in the one-eyed or when old and encapsulated. M. Davidson.

Whitney, L. H. Industrial first aid—eye injuries. *Sight-Saving Review*, 1944, v. 14, Winter, p. 183.

Attempts at treatment by employers, and delay by the employee in obtaining treatment for apparently trivial accidents, are two mistakes which need correction. The author speaks of the launching of an educational program intended to reduce accidents. Nurses are trained to perform efficient first-aid work. Major cases are referred to an outside ophthalmologist. Methods used in treating the more common injuries are described. Francis M. Crage.

## 17

### SYSTEMIC DISEASES AND PARASITES

Edgerton, A. E. Herpes zoster ophthalmicus. *Arch. of Ophth.*, 1945, v. 34, July, pp. 40-62, and Aug., pp. 114-153. (14½ page bibliography.) (See *Amer. Jour. Ophth.*, 1944, v. 27, Jan., p. 100.)

Ridley, Harold. Ocular onchocerciasis. *Brit. Jour. Ophth.*, 1945, Monograph Supplément X, 55 pp. (27 figures, 3 color plates, 1 table, bibliography.) (See editorial, *Amer. Jour. Ophth.*, 1945, v. 28, Nov., p. 1269.)

Srivastava, Lal. A case of filariasis of the eye. *Indian Med. Gaz.*, 1945, v. 80, Feb., p. 94.

Two filarial worms were seen moving freely in the region of the macula in a healthy female aged 26 years. The eye was otherwise healthy. Two intravenous injections of Soamin brought

no improvement. In discussion, Somerset advised removal of the worms through a corneal incision if and when they reached the anterior chamber.

Francis M. Crage.

## 18

### HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Fanta, H. Statistics as to the blind and partially blind. *Klin. M. f. Augenh.*, 1941, v. 106, May, pp. 547-556.

The patients were examined at the II University Eye Clinic in Vienna during the year 1939. The statistics include all the cases during 1939 with vision less than 6/60. As blind or practically blind were regarded cases with vision 1/60 or less. Among 6,250 eyes examined, 1,171 had vision less than 6/60. After attempts to improve vision 78 cases remained binocularly blind, 464 cases monocularly blind. These 542 cases included 263 female, 279 male. The highest number of cases of blindness was caused by cataract: 325 cases, of which operation was refused in 71. The next largest group (210) had diseases of the cornea; 157, pathology in the fundus; 91, glaucoma; 67, retinal detachment. Other pathologic conditions are tabulated. There were 78 blind or practically blind with amblyopia ex anopsia. These were mostly strabismus cases which had not received any treatment before the fifth year of life (at an age where treatment usually yields no or very limited therapeutic results). The author lays stress on the fact that

such patients are referred much too late by many general practitioners, as well as on the necessity of better education of physicians as well as parents, teachers, and kindergarten attendants. (1 table.)

F. Nelson.

Lancaster, W. B. Eye exercises—do they do any good? Do they do any harm? *Sight-Saving Review*, 1944, v. 14, Winter, p. 139.

The author analyzes vision as part physical wherein the retina and the ocular muscles including those of accommodation act together, and which he calls sensation; the other part mental, which he calls perceptive. Speed of reading has been shown to be improved by practice. Improvement in color blindness by the "light and filter" treatment has been found to be erroneous. The condition is congenital and incurable. Myopes who improve are probably "false" myopes whose accommodation becomes relaxed or who see "better" through their blur, but whose visual acuity is not really improved. Orthoptic exercises have been very successful in many instances of disturbances of motility where the nerve part of the neuromuscular mechanism was faulty, and not the muscles as had been previously thought.

Mention is made of extravagant claims of some of the methods and the possible harm in cases such as cancer and glaucoma where the proper treatment is neglected.

Francis M. Crage.



# NEWS ITEMS

Edited by DR. DONALD J. LYLE

904 Carew Tower, Cincinnati 2

News items should reach the editor by the twelfth of the month.

## MISCELLANEOUS

Due to transportation difficulties the examination of the American Board of Ophthalmology, originally scheduled for Los Angeles, January 28th to 31st has been changed to San Francisco, June 22d to 25th, inclusive, 1946.

1946 examinations: *Chicago*, January 18th through 22d; *New York*, April, approximately 10th to 13th; *San Francisco*, June 22d to 25th; *Chicago*, October 9th through 12th.

**Urgent:** All candidates are required to fill out a new blank regardless of previous correspondence and arrangement.

Medical Officers should notify the Secretary, Dr. S. Judd Beach, Cape Cottage, Maine, promptly of all changes of address so that communications may reach you promptly.

**List of Surgery:** A new ruling requires that candidates mail their lists of surgery to the Board office at least 60 days prior to their examination. All new applicants are now required to send list with application.

By the will of the late Dr. Paul L. Sartain, of Philadelphia, the sum of \$5,000 was bequeathed to the College of Physicians of Philadelphia, in trust for the creation of a "Library of Ophthalmological Illustrations." The trustee is to acquire by purchase or through gifts to the college, drawings and paintings delineating faithfully and accurately, as well as artistically, the ocular structures. High-class reproductions of illustrations in the ophthalmologic field, as by photographs or other methods may be accepted, and photographs, lantern slides, and films of any kind for projection on the screen may be selected. All acceptable specimens are to be properly mounted and catalogued and so arranged as to be readily consulted and used by the Fellows of the college and other accredited visitors. No efforts should be spared for the careful handling and preservation of such a library.

In addition, Dr. Sartain provided that "if at any time there should be a surplus of income from the Fund, such surplus may be used for the preparation of illustrations of interesting cases submitted by those unable to bear the expense of their delineation, but such illustrations should become the property of the College and be included in the Sartain Library."

The Sanford R. Gifford Memorial Lecture for 1946 will be delivered before the Chicago Ophthalmological Society on January 21st, by

Dr. Jonas Friedenwald. His subject will be "Disease processes versus disease pictures in the interpretation of retinal vascular lesions."

The ninth annual William Thornwall Davis Postgraduate Course in ocular surgery, pathology, and orthoptics will be held Monday, February 4, through Saturday, February 9, 1946, at the George Washington University School of Medicine, Washington, D.C. This course will be given by the resident staff of the Department of Ophthalmology and the Army Institute of Pathology and will be limited to 30 registrants. An outline of the course follows: Surgery: 10 hours of ocular surgery on animal eyes; Pathology: 15 hours of practical ocular pathology with microscopes, lantern slides, and demonstrations; Orthoptics: 12 hours of orthoptics with case demonstrations, instruments, and practical and didactic instruction.

The fee is \$200.00. For further details write to the secretary, Miss Mary E. Kramer, 927 17th Street, N.W., Washington 6, D.C.

The fifteenth annual Spring Clinical Conference of the Dallas Southern Clinical Society will be held from March 18th to 21st. The entire conference will be held in the Hotel Adolphus and will consist of general assemblies, afternoon clinics, round-table luncheons, clinical-pathologic conferences, evening symposia, postgraduate lecturers, motion pictures, and technical exhibits. Among the guest lecturers will be Dr. Edmund B. Spaeth of Philadelphia.

There is an all-inclusive registration fee of \$10.00. For information or advance registration write to the Secretary, 433 Medical Arts Building, Dallas 1, Texas.

There is now available a third printing of Alfred Bielschowsky's "Lectures on motor anomalies." Books are on sale at Dartmouth College Publications, Hanover, New Hampshire, at \$1.50 per copy, postpaid.

A brief course in "Ocular motility" was held at the Episcopal Eye, Ear, and Throat Hospital, Washington, D.C., from October 29th to December 13th. The course was primarily intended for the residents of the Hospital but was available to local and service ophthalmologists and technical assistants in ophthalmic offices. The instructors for the course were Alice McPhail, R.N., Dr. Frank Costenbader, Dr. Ernest Sheppard, and Dr. Richard Wilkinson.

## SOCIETIES

The Milwaukee Oto-Ophthalmic Society held its first regular meeting on October 23d at the Milwaukee Athletic Club. The scientific program consisted of the following presentations: "Analysis of poliomyelitis cases at South View Hospital—Effect of tonsillectomies" by Dr. Max J. Fox, and "German measles, a factor in congenital deafness and cataracts" by Drs. A. B. Schwartz and Meyer S. Fox.

The officers of the Washington, D.C., Ophthalmological Society for the 1945-1946 season are: Dr. John R. Lloyd, president; Dr. Richard W. Wilkinson, vice-president; and Dr. Edward J. Cummings, secretary-treasurer. The dates of the meetings for this season are November 5th, January 7th, March 4th, and May 6th.

At the meeting of the Southern Medical Association, which was held in Cincinnati, November 12-15, 1945, the following papers were presented to the Section on Ophthalmology and Otolaryngology: "The use of the Berman locator in removing magnetic intraocular foreign bodies" by Dr. B. Y. Alvis, Saint Louis, discussed by Dr. George M. Haik, New Orleans; and "Surgery of war deformities of the eyelids" by Capt. Alston Callahan (MC), Atlanta, discussed by Dr. Harvey B. Searcy, Tuscaloosa, Alabama.

Dr. Avery D. Prangen, Rochester, Minnesota, was among the guest lecturers at the fifteenth annual clinical conference of the Oklahoma Clinical Society which was held in Oklahoma City from November 26th to 29th.

At the thirteenth annual assembly of the Omaha Mid-West Clinical Society, which was held from October 22d to 26th, Dr. Henry P. Wagener spoke on "Loss of vision in patients with hypertensive disease and with diabetes."

The officers of the Minnesota Academy of Ophthalmology and Oto-Laryngology for the year 1945-1946 are: Dr. Karl C. Wold, presi-

dent; Dr. T. R. Fritsche, first vice-president; Dr. C. L. Oppegaard, second vice-president; Dr. William A. Kennedy, secretary-treasurer; and Drs. M. C. Pfunder, C. E. Stafford, and J. J. Hochfilzer, council members.

The forty-ninth meeting of the Reading Eye, Ear, Nose, and Throat Society was a joint meeting with the Berks County Medical Society on November 14, 1945. Dr. Lewis R. Wolf, of Temple University, Department of Ophthalmology, discussed "Retinal arteriolar sclerosis." Dr. John Lansbury, associate professor, Department of Internal Medicine, Temple University, spoke on "The medical management of hypertension." Dr. W. E. Burnett, professor of surgery, Temple University, addressed the group on "The Surgical management of hypertension."

## PERSONALS

The University of Illinois College of Medicine has announced the promotion of the following faculty members: Dr. Hiram J. Smith, to associate professor of ophthalmology; Dr. Carl Apple, to associate professor of ophthalmology; and Dr. Louis Bothman, to clinical professor of ophthalmology.

Dr. Albert D. Ruedemann, Cleveland, was among the speakers at the instructional course given by the American College of Allergists. He spoke on "Ocular allergy."

According to a recent release from the Office of the Surgeon General, Col. Frederic H. Thorne (MC), Commanding Officer of Old Farms Convalescent Hospital, Avon, Connecticut, has retired from the Army after 29 years of service with the Army Medical Department. Having spent the greater part of his military career in the field of ophthalmology, Colonel Thorne was appointed head of the Army's rehabilitation center for the blind at Avon, Connecticut, in 1944, and has helped develop and extend the blind training program there, pioneering in new training techniques.

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